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COMPANION
TO
THE OBSERVATORY,
A MONTHLY REVIEW OF ASTRONOMY.

EDITED BY
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TO

THE OBSERVATORY,

A MONTHLY REVIEW OF ASTRONOMY.

No. 495. 1916. Vol. XXXIX.

INTRODUCTION.

The 'Companion' for 1916 closely resembles that of last year.

The ephemerides of the minor planets Ceres, Pallas, Juno, and Vesta have been omitted this year. No other change has been made in the arrangement.

We have to thank Mr. Denning for the table of Meteor Radiants and M. Jonckheere for kindly revising the list of Double Stars.

The "Fraction of the Year" is reckoned from mean noon of January 1 to mean noon of the particular day. The Moon's Declination and Longitude of the Terminator are given for mean midnight. For the Terminator the sign + indicates longitudes reckoned from the central meridian in a westward direction, and the letters M. (morning) and E. (evening) signify that the Sun is rising or setting respectively on that longitude of the Moon's surface.

The angles of disappearance and reappearance for occultations are reckoned from the true north in the direction N. E. S. W. Position-angles of double stars are reckoned in the same way.

Greenwich Mean Time is used. The astronomical day reckoned from noon to noon is used in all cases, except on page 2, where the time of sunrise is given in civil time, and refers to the civil date given in the first column.

Date.	Day of Year.	Fr. of Year.	Sun.		⊙'s Dec. Noon.	M.T. at Apparent Noon.	Sid. T. at Mean Noon.	Moon's Phases.
			Rises.	Sets.				
1916.			h m	h m	° ′	h m s	h m s	d h m Jan.
Jan. 2	2	·003	8 8	4 0	23 1 S	0 3 40	18 43 13	● 4 16 45
9	9	·022	8 6	4 8	22 15	6 49	19 10 49	☽ 11 15 38
16	16	·041	8 2	4 17	21 8	9 33	19 38 25	○ 19 20 29
23	23	·060	7 54	4 30	19 41	11 43	20 6 0	☾ 27 12 35
30	30	·079	7 44	4 42	17 57	13 16	20 33 36	
Feb. 6	37	·099	7 34	4 54	15 56	14 10	21 1 12	Feb. ● 3 4 6
13	44	·118	7 21	5 7	13 42	14 24	21 28 48	☽ 10 10 20
20	51	·137	7 8	5 20	11 17	14 0	21 56 24	○ 18 14 29
27	58	·156	6 54	5 32	8 44	13 3	22 24 0	☾ 25 21 24
Mar. 5	65	·175	6 39	5 43	6 4	11 40	22 51 36	March. ● 3 15 58
12	72	·194	6 23	5 57	3 20	9 55	23 19 12	☽ 11 6 33
19	79	·214	6 7	6 9	0 34 S	7 56	23 46 48	○ 19 5 27
26	86	·233	5 51	6 21	2 11 N	5 48	0 14 23	☾ 26 4 22
April 2	93	·252	5 35	6 32	4 55	3 41	0 41 59	April. ● 2 4 21
9	100	·271	5 20	6 44	7 34	0 1 40	1 9 35	☽ 10 2 36
16	107	·290	5 4	6 56	10 6	23 59 51	1 37 11	○ 17 17 8
23	114	·309	4 50	7 7	12 31	58 19	2 4 47	☾ 24 10 38
30	121	·329	4 35	7 18	14 45	57 10	2 32 23	
May 7	128	·348	4 23	7 30	16 48	56 28	2 59 59	May. ● 1 17 29
14	135	·367	4 11	7 41	18 37	56 12	3 27 35	☽ 9 20 47
21	142	·386	4 2	7 50	20 11	56 24	3 55 10	○ 17 2 11
28	149	·405	3 54	8 0	21 27	57 3	4 22 46	☾ 23 17 16
								● 31 7 37
June 4	156	·424	3 48	8 8	22 26	58 5	4 50 22	June. ☽ 8 11 59
11	163	·444	3 45	8 14	23 5	23 59 23	5 17 58	○ 15 9 42
18	170	·463	3 44	8 18	23 25	0 0 51	5 45 34	☾ 22 1 16
25	177	·482	3 46	8 19	23 24	2 21	6 13 10	● 29 22 43
July 2	184	·501	3 49	8 19	23 3	3 47	6 40 46	July.
9	191	·520	3 55	8 15	22 23	4 59	7 8 22	☽ 7 23 55
16	198	·539	4 3	8 9	21 23	5 50	7 35 58	○ 14 16 40
23	205	·559	4 12	8 0	20 6	6 16	8 3 34	☾ 21 11 33
30	212	·578	4 21	7 51	18 33	6 16	8 31 10	● 29 14 15
Aug. 6	219	·597	4 34	7 38	16 44	5 45	8 58 45	August. ☽ 6 9 6
13	226	·616	4 44	7 26	14 42	4 45	9 26 21	○ 13 0 0
20	233	·635	4 55	7 12	12 29	3 18	9 53 57	☾ 20 0 53
27	240	·654	5 5	6 57	10 6	0 1 29	10 21 33	● 28 5 25
Sept. 3	247	·674	5 17	6 41	7 35	23 59 21	10 49 9	Sept. ☽ 4 16 27
10	254	·693	5 28	6 26	4 58	57 0	11 16 45	○ 11 8 31
17	261	·712	5 39	6 10	2 17 N	54 31	11 44 21	☾ 18 17 35
24	268	·731	5 50	5 54	0 26 S	52 4	12 11 57	● 26 19 34
Oct. 1	275	·750	6 2	5 38	3 10	49 44	12 39 32	Oct. ☽ 3 23 1
8	282	·769	6 14	5 22	5 52	47 38	13 7 8	○ 10 19 1
15	289	·789	6 26	5 6	8 30	45 52	13 34 44	☾ 18 13 9
22	296	·808	6 37	4 52	11 2	44 33	14 2 20	● 26 8 37
29	303	·827	6 49	4 38	13 27	43 49	14 29 56	
Nov. 5	310	·846	7 2	4 26	15 40	43 41	14 57 32	Nov. ☽ 2 5 51
12	317	·865	7 14	4 14	17 42	44 13	15 25 8	○ 9 8 18
19	324	·884	7 26	4 5	19 28	45 27	15 52 44	☾ 17 10 1
26	331	·904	7 37	3 57	20 57	47 22	16 20 20	● 24 20 50
Dec. 3	338	·923	7 48	3 52	22 6	49 52	16 47 55	Dec. ☽ 1 13 56
10	345	·942	7 56	3 50	22 55	52 51	17 15 31	○ 9 0 44
17	352	·961	8 2	3 50	23 22	56 10	17 43 7	☾ 17 6 6
24	359	·980	8 7	3 53	23 26	23 59 39	18 10 43	● 24 8 31
31	366	·999	8 8	3 58	23 7 S	0 3 6	18 38 19	☽ 31 0 7

For Moon's phases: ● signifies New; ☽ First Quarter; ○ Full; ☾ Last Quarter.

JANUARY.

Day.		Moon.			
Month.	Week.	Rises.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	S	17 23	21 8	23 56 S	−49·5 E.
2	**S**	18 45	22 13	26 23	−61·7 E.
3	M	19 51	23 20	26 56	−73·9 E.
4	Tu	sets	......	25 28	−86·1 E.
5	W	4 21	0 25	22 9	+81·7 M.
6	Th	5 54	1 26	17 24	+69·5 M.
7	F	7 23	2 22	11 44	+57·4 M.
8	S	8 50	3 13	5 38 S	+45·2 M.
9	**S**	10 10	4 0	0 31 N	+33·0 M.
10	M	11 27	4 45	6 27	+20·8 M.
11	Tu	12 43	5 29	11 55	+ 8·7 M.
12	W	13 56	6 13	16 47	− 3·5 M.
13	Th	15 10	6 59	20 51	−15·7 M.
14	F	16 20	7 46	24 0	−27·8 M.
15	S	17 24	8 35	26 5	−40·0 M.
16	**S**	18 21	9 25	26 58	−52·1 M.
17	M	19 6	10 16	26 38	−64·2 M.
18	Tu	19 41	11 6	25 5	−76·4 M.
19	W	rises	11 55	22 23	−88·5 M.
20	Th	4 41	12 42	18 42	+79·4 E.
21	F	5 55	13 27	14 12	+67·3 E.
22	S	7 8	14 10	9 4	+55·1 E.
23	**S**	8 21	14 52	3 31 N	+43·0 E.
24	M	9 35	15 35	2 16 S	+30·9 E.
25	Tu	10 52	16 20	8 4	+18·7 E.
26	W	12 10	17 7	13 37	+ 6·6 E.
27	Th	13 34	17 58	18 40	− 5·6 E.
28	F	14 59	18 54	22 50	−17·8 E.
29	S	16 21	19 55	25 44	−29·9 E.
30	**S**	17 33	20 59	26 59	−42·1 E.
31	M	18 28	22 4	26 22 S	−54·3 E.

FEBRUARY.

Day.		Moon.			
Month.	Week.	Rises.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	Tu	19 7	23 6	23 53 S	−66·5 E.
2	W	sets	......	19 45	−78·7 E.
3	Th	4 48	0 4	14 26	+89·1 M.
4	F	6 17	0 58	8 24	+76·9 M.
5	S	7 41	1 48	2 5 S	+64·7 M.
6	**S**	9 2	2 35	4 8 N	+52·5 M.
7	M	10 20	3 21	9 59	+40·4 M.
8	Tu	11 39	4 6	15 13	+28·2 M.
9	W	12 52	4 53	19 39	+16·0 M.
10	Th	14 6	5 40	23 9	+ 3·8 M.
11	F	15 14	6 29	25 35	− 8·3 M.
12	S	16 14	7 19	26 50	−20·5 M.
13	**S**	17 2	8 10	26 52	−32·7 M.
14	M	17 41	9 0	25 40	−44·8 M.
15	Tu	18 10	9 50	23 18	−57·0 M.
16	W	18 31	10 37	19 53	−69·1 M.
17	Th	rises	11 23	15 35	−81·2 M.
18	F	4 53	12 7	10 34	+86·6 E.
19	S	6 8	12 51	5 2 N	+74·5 E.
20	**S**	7 23	13 34	0 47 S	+62·4 E.
21	M	8 40	14 18	6 40	+50·2 E.
22	Tu	9 58	15 5	12 21	+38·1 E.
23	W	11 20	15 55	17 31	+25·9 E.
24	Th	12 44	16 49	21 53	+13·8 E.
25	F	14 7	17 47	25 4	+ 1·6 E.
26	S	15 21	18 48	26 45	−10·6 E.
27	**S**	16 20	19 50	26 43	−22·8 E.
28	M	17 4	20 52	24 53	−35·0 E.
29	Tu	17 35	21 50	21 26 S	−47·2 E.

MARCH.

Day.		Moon.			
Month.	Week.	Rises.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	W	17 57	22 44	16 41 S	−59·3 E.
2	Th	18 15	23 35	11 0	−71·6 E.
3	F	sets	......	4 50 S	−83·8 E.
4	S	6 35	0 23	1 28 N	+84·0 M.
5	**S**	7 54	1 10	7 32	+71·8 M.
6	M	9 13	1 57	13 7	+59·6 M.
7	Tu	10 31	2 43	17 58	+47·4 M.
8	W	11 46	3 31	21 53	+35·2 M.
9	Th	12 58	4 20	24 45	+23·0 M.
10	F	14 3	5 11	26 25	+10·9 M.
11	S	14 56	6 2	26 52	− 1·3 M.
12	**S**	15 37	6 52	26 4	−13·5 M
13	M	16 10	7 42	24 6	−25·7 M.
14	Tu	16 34	8 30	21 3	−37·8 M.
15	W	16 54	9 16	17 3	−50·0 M.
16	Th	17 9	10 1	12 17	−62·2 M.
17	F	7 23	10 45	6 54	−74·3 M.
18	S	rises	11 29	1 7 N	−86·5 M.
19	**S**	6 22	12 14	4 50 S	+81·4 E.
20	M	7 43	13 1	10 41	+69·2 E
21	Tu	9 4	13 50	16 7	+57·1 E.
22	W	10 28	14 44	20 46	+44·9 E.
23	Th	11 54	15 41	24 17	+32·8 E.
24	F	13 11	16 42	26 20	+20·6 E.
25	S	14 15	17 44	26 41	+ 8·4 E.
26	**S**	15 3	18 45	25 18	− 3·8 E.
27	M	15 37	19 43	22 19	−16·0 E.
28	Tu	16 1	20 37	18 1	−28·2 E.
29	W	16 21	21 27	12 45	−40·4 E.
30	Th	16 38	22 15	6 53	−52 6 E.
31	F	16 50	23 2	0 46 S	−64·8 E.

APRIL.

Day.		Moon.			
Month.	Week.	Rises.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	S	17 5	23 48	5 18 N	−77·0 E.
2	**S**	sets	......	11 1	−89·3 E.
3	M	8 7	0 34	16 8	+78·5 M.
4	Tu	9 25	1 22	20 25	+66·3 M.
5	W	10 39	2 11	23 40	+54·1 M.
6	Th	11 46	3 1	25 46	+41·9 M.
7	F	12 46	3 53	26 38	+29·7 M.
8	S	13 33	4 44	26 14	+17·5 M.
9	**S**	14 9	5 34	24 39	+ 5·3 M.
10	M	14 35	6 22	21 59	− 6·9 M.
11	Tu	14 57	7 9	18 21	−19·1 M.
12	W	15 13	7 54	13 55	−31·3 M.
13	Th	15 29	8 38	8 49	−43·5 M.
14	F	15 42	9 21	3 14 N	−55·7 M.
15	S	15 55	10 5	2 38 S	−67·8 M.
16	**S**	16 10	10 51	8 33	−80·0 M.
17	M	rises	11 41	14 13	+87·8 E.
18	Tu	8 5	12 34	19 14	+75·7 E.
19	W	9 33	13 32	23 12	+63·5 E.
20	Th	10 56	14 33	25 44	+51·3 E.
21	F	12 7	15 36	26 32	+39·1 E.
22	S	13 0	16 39	25 32	+27·0 E.
23	**S**	13 38	17 38	22 52	+14·8 E.
24	M	14 5	18 33	18 50	+ 2·6 E.
25	Tu	14 27	19 24	13 49	− 9·6 E.
26	W	14 43	20 12	8 11	−21·9 E.
27	Th	14 56	20 58	2 14 S	−34·1 E.
28	F	15 10	21 43	3 42 N	−46·3 E.
29	S	15 27	22 29	9 24	−58·5 E.
30	**S**	15 42	23 15	14 36 N	−70·8 E.

MAY.					
Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Termi-nator.
		h m	h m	° ′	°
1	M	sets	……	19 5 N	−83·0 E.
2	Tu	8 20	0 3	22 38	+84·8 M.
3	W	9 31	0 53	25 4	+72·5 M.
4	Th	10 33	1 44	26 18	+60·3 M.
5	F	11 26	2 36	26 17	+48·1 M.
6	S	12 6	3 26	25 3	+35·8 M.
7	**S**	12 36	4 15	22 42	+23·6 M.
8	M	12 58	5 2	19 23	+11·4 M.
9	Tu	13 17	5 47	15 16	− 0·8 M.
10	W	13 33	6 31	10 28	−13·0 M.
11	Th	13 47	7 13	5 9 N	−25·2 M.
12	F	14 0	7 56	0 30 S	−37·4 M.
13	S	14 13	8 41	6 19	−49·6 M.
14	**S**	14 31	9 28	12 2	−61·8 M.
15	M	14 51	10 19	17 18	−74·0 M.
16	Tu	rises	11 16	21 45	−86·2 M.
17	W	8 30	12 17	24 53	+81·7 E.
18	Th	9 48	13 21	26 20	+69·5 E.
19	F	10 52	14 27	25 53	+57·3 E.
20	S	11 36	15 29	23 36	+45·1 E.
21	**S**	12 7	16 28	19 47	+32·9 E.
22	M	12 31	17 21	14 52	+20·7 E.
23	Tu	12 49	18 10	9 17	+ 8·5 E.
24	W	13 4	18 57	3 22 S	− 3·7 E.
25	Th	13 18	19 42	2 33 N	−15·9 E.
26	F	13 32	20 27	8 15	−28·2 E.
27	S	13 48	21 12	13 30	−40·4 E.
28	**S**	14 7	21 59	18 5	−52·7 E.
29	M	14 30	22 48	21 48	−64·9 E.
30	Tu	15 2	23 38	24 30	−77·1 E.
31	W	sets	……	26 1 N	−89·4 E.

JUNE.					
Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Termi-nator.
		h m	h m	° ′	°
1	Th	9 19	0 30	26 19 N	+78·4 M.
2	F	10 3	1 21	25 23	+66·1 M.
3	S	10 37	2 10	23 19	+53·9 M.
4	**S**	11 2	2 58	20 15	+41·6 M.
5	M	11 21	3 43	16 21	+29·4 M.
6	Tu	11 39	4 27	11 47	+17·2 M.
7	W	11 52	5 9	6 42	+ 4·9 M.
8	Th	12 5	5 51	1 16 N	− 7·3 M.
9	F	12 17	6 33	4 22 S	−19·5 M.
10	S	12 35	7 18	10 0	−31·7 M.
11	**S**	12 51	8 6	15 20	−43·9 M.
12	M	13 15	8 58	20 4	−56·1 M.
13	Tu	13 47	9 57	23 45	−68·3 M.
14	W	14 34	11 0	25 56	−80·5 M.
15	Th	rises	12 6	26 15	+87·3 E.
16	F	9 28	13 12	24 37	+75·1 E.
17	S	10 6	14 14	21 14	+62·9 E.
18	**S**	10 33	15 12	16 29	+50·8 E.
19	M	10 54	16 5	10 52	+38·6 E.
20	Tu	11 10	16 53	4 51 S	+26·3 E.
21	W	11 25	17 40	1 14 N	+14·1 E.
22	Th	11 39	18 25	7 5	+ 1·9 E.
23	F	11 56	19 11	12 29	−10·3 E.
24	S	12 12	19 57	17 13	−22·6 E.
25	**S**	12 34	20 45	21 7	−34·8 E.
26	M	13 3	21 35	24 1	−47·0 E.
27	Tu	13 39	22 26	25 48	−59·3 E.
28	W	14 26	23 17	26 22	−71·5 E.
29	Th	sets	……	25 43	−83·8 E.
30	F	8 39	0 7	23 55 N	+84·0 M.

JULY.					
Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Termi-nator.
		h m	h m	° ′	°
1	S	9 7	0 55	21 4 N	+71·7 M.
2	**S**	9 28	1 41	17 20	+59·5 M.
3	M	9 45	2 25	12 55	+47·2 M.
4	Tu	9 59	3 7	7 58	+35·0 M.
5	W	10 14	3 48	2 40 N	+22·7 M.
6	Th	10 25	4 30	2 50 S	+10·5 M.
7	F	10 39	5 12	8 21	− 1·7 M.
8	S	10 55	5 58	13 40	−13·9 M.
9	**S**	11 17	6 46	18 30	−26·2 M.
10	M	11 41	7 40	22 30	−38·4 M.
11	Tu	12 20	8 40	25 16	−50·6 M.
12	W	13 14	9 43	26 23	−62·8 M.
13	Th	14 28	10 49	25 36	−75·0 M.
14	F	rises	11 54	22 55	−87·1 M.
15	S	8 31	12 55	18 38	+80·7 E.
16	**S**	8 56	13 5	13 11	+68·5 E.
17	M	9 15	14 44	7 5	+56·3 E.
18	Tu	9 30	15 33	0 46 S	+44·1 E.
19	W	9 45	16 20	5 22 N	+31·9 E.
20	Th	10 2	17 7	11 4	+19·7 E.
21	F	10 19	17 54	16 5	+ 7·5 E.
22	S	10 39	18 42	20 16	− 4·8 E.
23	**S**	11 5	19 31	23 27	−17·0 E.
24	M	11 39	20 22	25 31	−29·2 E.
25	Tu	12 23	21 13	26 23	−41·5 E.
26	W	13 17	22 3	26 1	−53·7 E.
27	Th	14 19	22 5	24 29	−66·0 E.
28	F	15 27	23 39	21 52	−78·2 E.
29	S	sets	……	18 20	+89·5 M.
30	**S**	7 53	0 24	14 3	+77·3 M.
31	M	8 8	1 6	9 12 N	+65·0 M.

AUGUST.					
Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Termi-nator.
		h m	h m	° ′	°
1	Tu	8 21	1 48	3 57 N	+52·8 M.
2	W	8 34	2 29	1 31 S	+40·6 M.
3	Th	8 46	3 11	7 0	+28·3 M.
4	F	9 1	3 55	12 18	+16·1 M.
5	S	9 19	4 41	17 12	+ 3·9 M.
6	**S**	9 43	5 32	21 22	− 8·4 M.
7	M	10 15	6 27	24 29	−20·6 M.
8	Tu	11 0	7 27	26 10	−32·8 M.
9	W	12 3	8 30	26 9	−45·0 M.
10	Th	13 23	9 34	24 17	−57·2 M.
11	F	14 54	10 36	20 42	−69·4 M.
12	S	rises	11 34	15 45	−81·5 M.
13	**S**	7 17	12 29	9 50	+86·3 E.
14	M	7 36	13 21	3 29 S	+74·1 E.
15	Tu	7 50	14 10	2 54 N	+61·9 E.
16	W	8 6	14 58	8 58	+49·7 E.
17	Th	8 24	15 46	14 24	+37·5 E.
18	F	8 43	16 35	18 59	+25·3 E.
19	S	9 8	17 25	22 34	+13·1 E.
20	**S**	9 39	18 16	24 59	+ 0·9 E.
21	M	10 20	19 8	26 12	−11·3 E.
22	Tu	11 10	19 58	26 11	−23·5 E.
23	W	12 11	20 48	24 58	−35·7 E.
24	Th	13 17	21 35	22 38	−48·0 E.
25	F	14 27	22 21	19 21	−60·2 E.
26	S	15 37	23 5	15 15	−72·5 E.
27	**S**	16 49	23 47	10 31	−84·7 E.
28	M	sets	……	5 20 N	+83·1 M.
29	Tu	6 46	0 29	0 7 S	+70·8 M.
30	W	6 55	1 11	5 39	+58·6 M.
31	Th	7 10	1 54	11 2 S	+46·4 M.

SEPTEMBER.

Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	F	7 27	2 40	16 2 S	+34·1 M.
2	S	7 49	3 29	20 21	+21·9 M.
3	**S**	8 16	4 22	23 41	+ 9·7 M.
4	M	8 57	5 19	25 44	− 2·5 M.
5	Tu	9 51	6 19	26 13	−14·7 M.
6	W	11 1	7 20	25 0	−26·9 M.
7	Th	12 25	8 21	22 7	−39·1 M.
8	F	13 56	9 19	17 47	−51·3 M.
9	S	15 25	10 15	12 22	−63·5 M.
10	**S**	16 51	11 7	6 15 S	−75·6 M.
11	M	rises	11 57	0 8 N	−87·8 M.
12	Tu	6 10	12 46	6 23	+80·0 E.
13	W	6 27	13 35	12 10	+67·9 E.
14	Th	6 47	14 25	17 11	+55·7 E.
15	F	7 9	15 16	21 14	+43·5 E.
16	S	7 38	16 8	24 7	+31·3 E.
17	**S**	8 16	17 0	25 46	+19·1 E.
18	M	9 3	17 51	26 8	+ 6·9 E.
19	Tu	10 1	18 42	25 17	− 5·3 E.
20	W	11 4	19 30	23 18	−17·5 E.
21	Th	12 12	20 16	20 18	−29·7 E.
22	F	13 24	21 0	16 28	−41·9 E.
23	S	14 33	21 43	11 57	−54·1 E.
24	**S**	15 45	22 25	6 54	−66·3 E.
25	M	16 58	23 8	1 30 N	−78·6 E.
26	Tu	18 10	23 51	4 3 S	+89·2 M.
27	W	sets	......	9 32	+77·0 M.
28	Th	5 34	0 37	14 42	+64·8 M.
29	F	5 55	1 26	19 15	+52·5 M.
30	S	6 21	2 18	22 51 S	+40·3 M.

OCTOBER.

Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	**S**	6 57	3 14	25 12 S	+28·1 M.
2	M	7 47	4 13	26 2	+15·9 M.
3	Tu	8 53	5 14	25 13	+ 3·7 M.
4	W	10 11	6 14	22 49	− 8·5 M.
5	Th	11 35	7 11	18 59	−20·7 M.
6	F	13 3	8 6	14 2	−32·8 M.
7	S	14 27	8 57	8 19	−45·0 M.
8	**S**	15 51	9 47	2 12 S	−57·2 M.
9	M	17 14	10 35	3 59 N	−69·3 M.
10	Tu	rises	11 24	9 53	−81·5 M.
11	W	4 51	12 13	15 11	+86·4 E.
12	Th	5 10	13 4	19 37	+74·2 E.
13	F	5 37	13 56	22 59	+62·1 E.
14	S	6 12	14 49	25 6	+49·9 E.
15	**S**	6 56	15 42	25 55	+37·7 E.
16	M	7 49	16 33	25 27	+25·6 E.
17	Tu	8 54	17 23	23 49	+13·4 E.
18	W	9 59	18 10	21 9	+ 1·2 E.
19	Th	11 9	18 54	17 36	−11·0 E.
20	F	12 19	19 38	13 21	−23·2 E.
21	S	13 30	20 20	8 31	−35·4 E.
22	**S**	14 39	21 2	3 17 N	−47·6 E.
23	M	15 52	21 45	2 11 S	−59·8 E.
24	Tu	17 8	22 30	7 42	−72·0 E.
25	W	18 25	23 18	13 1	−84·2 E.
26	Th	sets	......	17 50	+83·6 M.
27	F	4 23	0 10	21 47	+71·4 M.
28	S	4 56	1 6	27 32	+59·2 M.
29	**S**	5 43	2 6	25 46	+47·0 M.
30	M	6 45	3 8	25 19	+34·8 M.
31	Tu	8 2	4 8	23 13 S	+ 2·6 M.

NOVEMBER.

Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	W	9 25	5 7	19 41 S	+10·4 M.
2	Th	10 50	6 2	15 2	− 1·8 M.
3	F	12 13	6 53	9 35	−13·9 M.
4	S	13 35	7 42	3 42 S	−26·1 M.
5	**S**	14 56	8 30	2 18 N	−38·2 M.
6	M	16 16	9 17	8 8	−50·4 M.
7	Tu	17 35	10 5	13 30	−62·5 M.
8	W	18 53	10 54	18 9	−74·7 M.
9	Th	rises	11 46	21 50	−86·8 M.
10	F	4 8	12 38	24 21	+81·1 E.
11	S	4 48	13 31	25 36	+68·9 E.
12	**S**	5 39	14 24	25 33	+56·8 E.
13	M	6 38	15 14	24 16	+44·6 E.
14	Tu	7 45	16 3	21 55	+32·5 E.
15	W	8 54	16 48	18 38	+20·3 E.
16	Th	10 2	17 32	14 37	+ 8·1 E.
17	F	11 12	18 13	10 2	− 4·0 E.
18	S	12 20	18 55	5 0 N	−16·2 E.
19	**S**	13 32	19 37	0 18 S	−28·4 E.
20	M	14 44	20 20	5 43	−40·6 E.
21	Tu	16 0	21 6	11 3	−52·7 E.
22	W	17 19	21 57	16 3	−64·9 E.
23	Th	18 43	22 51	20 22	−77·1 E.
24	F	20 4	23 51	23 37	−89·3 E.
25	S	sets	......	25 25	+78·5 M.
26	**S**	4 31	0 54	25 31	+66·3 M.
27	M	5 45	1 57	23 50	+54·1 M.
28	Tu	7 8	2 59	20 34	+41·9 M.
29	W	8 36	3 57	16 2	+29·7 M.
30	Th	10 1	4 50	10 40 S	+17·6 M.

DECEMBER.

Day.		Moon.			
Month.	Week.	Sets.	Souths.	Dec.	Long. of Terminator.
		h m	h m	° ′	°
1	F	11 24	5 40	4 50 S	+ 5·4 M.
2	S	12 46	6 28	1 8 N	− 6·8 M.
3	**S**	14 6	7 15	6 56	−19·0 M.
4	M	15 22	8 2	12 19	−31·1 M.
5	Tu	16 39	8 49	17 4	−43·2 M.
6	W	17 54	9 39	20 56	−55·4 M.
7	Th	19 4	10 30	23 44	−67·5 M.
8	F	rises	11 23	25 19	−79·6 M.
9	S	3 31	12 15	25 38	+88·2 E.
10	**S**	4 28	13 7	24 42	+76·1 E.
11	M	5 31	13 56	22 38	+64·0 E.
12	Tu	6 39	14 43	19 36	+51·8 E.
13	W	7 48	15 27	15 47	+39·7 E.
14	Th	8 57	16 9	11 22	+27·6 E.
15	F	10 5	16 50	6 31	+15·4 E.
16	S	11 14	17 31	1 23 N	+ 3·3 E.
17	**S**	12 25	18 12	3 54 S	− 8·9 E.
18	M	13 37	18 56	9 10	−21·1 E.
19	Tu	14 52	19 43	14 11	−33·2 E.
20	W	16 13	20 34	18 43	−45·4 E.
21	Th	17 34	21 31	22 24	−57·6 E.
22	F	18 52	22 33	24 51	−69·8 E.
23	S	19 59	23 37	25 42	−82·0 E.
24	**S**	sets	......	24 43	+85·8 M.
25	M	4 39	0 41	21 58	+73·7 M.
26	Tu	6 9	1 43	17 42	+61·5 M.
27	W	7 40	2 40	12 22	+49·3 M.
28	Th	9 8	3 34	6 26	+37·1 M.
29	F	10 31	4 24	0 18 S	+24·9 M.
30	S	11 52	5 12	5 41 N	+12·8 M.
31	**S**	13 11	6 0	11 14 N	+ 0·6 M.

1916.	Mercury (☿).						Venus (♀).						Mars (♂).					
	R.A. Noon.	Dec. Noon.	Diam.	Rises.	Transits.	Sets.	R.A. Noon.	Dec. Noon.	Diam.	Rises.	Transits.	Sets.	R.A. Noon.	Dec. Noon.	Diam.	Rises.	Transits.	Sets.
	h m s	° ′	″	h m	h m	h m	h m s	° ′	″	h m	h m	h m	h m s	° ′	″	h m	h m	h m
Jan. 1...	19 25 11	24 11 S.	4·9	20 53	0 46	4 34	20 39 32	20 11 S.	11·6	21 46	2 0	6 14	10 12 48	14 50 N	11·3	8 10	15 31	22 52
11...	20 33 12	20 36	5·6	21 4	1 15	5 26	21 29 35	16 37	12·0	21 35	2 11	6 47	10 10 30	15 28	12·3	7 25	14 49	22 13
21...	21 24 57	15 17	7·0	20 43	1 27	6 11	22 17 22	12 19	12·5	21 19	2 19	7 19	10 2 57	16 30	13·1	6 32	14 2	21 32
31...	21 27 2	12 11	9·4	19 48	0 49	5 50	23 3 9	7 29	13·0	21 0	2 26	7 52	9 50 38	17 49	13·7	5 32	13 10	20 48
Feb. 10...	20 43 41	14 30	10·1	18 33	23 20	4 7	23 47 28	2 20 S.	13·6	20 38	2 30	8 22	9 35 16	19 11	13·9	4 29	12 15	20 1
20...	20 34 18	16 58	8·5	18 2	22 36	3 10	0 30 55	2 55 N.	14·3	20 16	2 35	8 54	9 19 39	20 17	13·6	3 28	11 21	19 14
Mar. 1...	21 4 6	17 0	7·1	17 54	22 28	3 2	1 14 4	8 4	15·1	19 54	2 38	9 22	9 6 39	20 58	12·9	2 31	10 29	18 27
11...	21 52 6	14 37	6·1	17 51	22 38	3 25	1 57 29	12 56	16·1	19 31	2 42	9 53	8 58 14	21 11	12·1	1 42	9 41	17 40
21...	22 48 28	10 2	5·5	17 43	22 56	4 9	2 41 30	17 19	17·3	19 11	2 47	10 23	8 55 7	21 0	11·1	1 0	8 59	16 58
31...	23 50 31	3 25 S.	5·2	17 31	23 19	5 7	3 26 10	21 2	18·7	18 52	2 52	10 52	8 57 0	20 28	10·2	0 27	8 22	16 17
Apr. 10...	0 59 16	4 54 N.	5·0	17 20	23 49	6 18	4 11 12	23 56	20·4	18 37	2 58	11 19	9 3 13	19 40	9·4	23 59	7 49	15 39
20...	2 16 9	13 58	5·2	17 5	0 23	7 41	4 55 45	25 55	22·6	18 28	3 3	11 38	9 12 55	18 38	8·6	23 35	7 19	15 3
30..	3 33 57	21 13	6·0	17 0	1 2	9 4	5 38 28	26 57	25·3	18 22	3 6	11 50	9 25 20	17 23	8·0	23 17	6 52	14 27
May 10...	4 35 45	24 35	7·6	16 59	1 24	9 49	6 17 32	27 3	28·7	18 22	3 6	11 50	9 39 53	15 55	7·4	23 0	6 27	13 54
20...	5 9 9	24 28	9·7	16 55	1 18	9 41	6 50 29	26 22	33·1	18 20	2 59	11 38	9 56 3	14 17	6·9	22 46	6 4	13 22
30...	5 9 11	22 0	11·7	16 34	0 38	8 42	7 11 24	25 7	38·7	18 16	2 44	11 12	10 13 28	12 28	6·5	22 35	5 42	12 49
June 9...	4 48 43	18 52	12·0	15 49	23 33	7 17	7 25 42	23 30	45·4	17 59	2 15	10 31	10 31 54	10 29	6·2	22 25	5 21	12 17
19...	4 39 27	17 45	10·3	15 10	22 47	6 24	7 20 48	21 46	52·5	17 28	1 31	9 34	10 51 7	8 22	5·9	22 16	5 1	11 46
29...	4 59 47	19 23	8·1	14 42	22 31	6 20	7 0 16	20 0	57·4	16 40	0 31	8 22	11 11 1	6 7	5·6	22 8	4 42	11 16
July 9...	5 51 23	22 7	6·4	14 38	22 46	6 54	6 33 57	18 27	56·8	15 38	23 19	7 0	11 31 33	3 46	5·4	22 1	4 23	10 45
19...	7 10 48	23 8	5·4	15 12	23 28	7 44	6 16 19	17 33	51·6	14 49	22 24	5 59	11 52 40	1 19 N.	5·2	21 55	4 5	10 15
29...	8 40 22	20 8	5·0	16 17	0 13	8 9	6 14 40	17 25	44·5	14 9	21 44	5 19	12 14 22	1 12 S.	5·0	21 49	3 47	9 45
Aug. 8...	9 58 53	13 59	5·0	17 34	0 52	8 10	6 27 44	17 45	38·0	13 41	21 19	4 57	12 36 43	3 45	4·9	23 45	3 30	9 15
18...	11 2 47	6 46 N.	5·4	18 39	1 17	7 55	6 51 50	18 8	32·8	13 24	21 5	4 46	12 59 46	6 19	4·7	23 43	3 14	8 45
28...	11 55 20	0 19 S.	5·9	19 28	1 30	7 32	7 23 41	18 11	28·6	13 17	20 58	4 39	13 23 34	8 52	4·6	21 39	2 58	8 17
Sept. 7...	12 37 46	6 30	6·8	20 2	1 33	7 4	8 0 43	17 39	25·3	13 18	20 56	4 34	13 48 14	11 22	4·5	21 38	2 43	7 48
17...	13 5 53	10 47	8·0	20 13	1 21	6 29	8 41 2	16 23	22·7	13 27	20 57	4 27	14 13 49	13 46	4·4	21 37	2 29	7 21
27...	13 6 4	11 3	9·7	19 36	0 42	5 48	9 23 16	14 20	20·6	13 41	21 0	4 19	14 40 26	16 3	4·4	21 37	2 17	6 57
Oct. 7...	12 32 50	5 6	9·9	17 47	23 23	4 59	10 6 25	11 33	18·8	14 1	21 4	4 7	15 8 9	18 8	4·3	21 38	2 5	6 32
17...	12 25 28	1 11	7·6	16 43	22 41	4 39	10 49 56	8 6	17·4	14 23	21 8	3 53	15 36 58	20 1	4·2	21 39	1 54	6 9
27...	13 7 20	4 55	5·8	17 9	22 47	4 25	11 33 38	4 8 N.	16·2	14 47	21 12	3 37	16 6 56	21 37	4·2	21 40	1 45	5 50
Nov. 6...	14 5 59	11 18	5·0	18 2	23 7	4 12	12 17 36	0 10 S.	15·2	15 14	21 17	3 20	16 37 57	22 54	4·1	21 39	1 36	5 33
16...	15 8 15	17 19	4·7	18 58	23 30	4 2	13 2 7	4 37	14·4	15 42	21 22	3 2	17 9 56	23 48	4·1	21 39	1 29	5 19
26...	16 12 49	21 59	4·6	19 52	23 55	3 58	13 47 38	9 2	13·6	16 10	21 28	2 46	17 42 41	24 18	4·1	21 35	1 22	5 9
Dec. 6...	17 20 4	24 50	4·7	20 27	0 20	4 3	14 34 35	13 10	13·0	16 41	21 36	2 31	18 15 59	24 22	4·1	21 30	1 16	5 2
16...	18 29 6	25 29	5·0	21 12	0 50	4 28	15 23 20	16 50	12·5	17 10	21 45	2 20	18 49 33	23 59	4·0	21 21	1 10	4 59
26...	19 35 34	23 40 S.	5·7	21 26	1 17	5 8	16 14 2	19 48 S.	12·0	17 41	21 57	2 13	19 23 6	23 8 S.	4·0	21 9	1 4	4 59

Jupiter (♃).

1916.	R.A. Noon.	Dec. Noon.	Diam.	Rises.	Transits.	Sets.
	h m s	° ′	″	h m	h m	h m
Jan. 1	23 33 36	4 13 S.	35·3	23 13	4 54	10 35
21	23 45 43	2 50	33·5	21 58	3 47	9 36
Feb. 10	0 0 24	1 12 S.	32·1	20 46	2 43	8 40
Mar. 1	0 16 48	0 37 N.	31·2	19 35	1 41	7 47
21	0 34 13	2 30	30·7	18 24	0 40	6 56
Apr. 10	0 52 2	4 24	30·6	17 10	23 35	6 0
30	1 9 40	6 13	31·0	16 0	22 34	5 8
May 20	1 26 33	7 53	31·8	14 50	21 32	4 14
June 9	1 42 4	9 20	33·0	13 38	20 29	3 20
29	1 55 28	10 32	34·6	12 27	19 24	2 21
July 19	2 5 55	11 24	36·6	11 14	18 15	1 16
Aug. 8	2 12 29	11 54	39·0	9 59	17 3	0 7
28	2 14 20	11 59	41·6	8 41	15 46	22 51
Sept. 17	2 11 5	11 38	43·9	7 21	14 24	21 27
Oct. 7	2 3 26	10 55	45·5	6 0	12 58	19 56
27	1 53 22	10 0	45·9	4 35	11 29	18 23
Nov. 16	1 43 51	9 10	44·9	3 11	10 1	16 51
Dec. 6	1 37 40	8 41	42·8	1 49	8 36	15 23
26	1 36 21	8 40 N.	40·2	0 30	7 17	14 4

Saturn (♄).

1916.	R.A. Noon.	Dec. Noon.	Diam.	Rises.	Transits.	Sets.
	h m s	° ′	″	h m	h m	h m
Jan. 1	6 57 34	22 18 N.	19·1	4 9	12 16	20 23
21	6 50 37	22 29	19·0	2 43	10 51	18 59
Feb. 10	6 44 58	22 38	18·6	1 17	9 26	17 35
Mar. 1	6 41 51	22 45	18·1	23 55	8 5	16 15
21	6 41 50	22 47	17·4	22 35	6 46	14 57
Apr. 10	6 44 59	22 47	16·8	22 20	5 31	13 42
30	6 50 56	22 42	16·2	18 8	4 18	12 28
May 20	6 59 6	22 34	15·8	18 58	3 7	11 16
June 9	7 8 51	22 21	15·5	17 51	1 58	10 5
29	7 19 35	22 4	15·3	16 45	0 50	8 55
July 19	7 30 39	21 43	15·3	15 36	23 39	7 42
Aug. 8	7 41 27	21 20	15·4	14 31	22 32	6 33
28	7 51 25	20 56	15·7	13 24	21 23	5 22
Sept. 17	7 59 57	20 35	16·1	12 17	20 13	4 9
Oct. 7	8 6 26	20 18	16·6	11 6	19 0	2 54
27	8 10 20	20 8	17·2	9 52	17 45	1 38
Nov. 16	8 11 15	20 7	17·8	8 35	16 28	0 21
Dec. 6	8 9 5	20 16	18·4	7 13	15 7	23 1
26	8 4 15	20 33 N.	18·9	5 47	13 43	21 39

Uranus (♅).

Jan. 1	21 5 31	17 21 S.	3·2	21 55	2 26	6 57
31	21 12 8	16 51	3·2	20 0	0 34	5 8
Mar. 1	21 18 58	16 21	3·2	18 3	22 40	3 17
31	21 24 44	15 55	3·3	16 8	20 47	1 26
Apr. 30	21 28 25	15 38	3·3	14 12	18 53	23 34
May 30	21 29 20	15 35	3·4	12 15	16 56	21 37
June 29	21 27 29	15 45	3·5	10 16	14 56	19 36
July 29	21 23 32	16 4	3·5	8 15	12 54	17 33
Aug. 28	21 18 52	16 26	3·5	6 15	10 51	15 27
Sept. 27	21 15 11	16 42	3·5	4 15	8 50	13 25
Oct. 27	21 13 50	16 47	3·4	2 17	6 51	11 25
Nov. 26	21 15 29	16 39	3·3	0 19	4 54	9 29
Dec. 26	21 19 50	16 18 S.	3·2	22 24	3 1	7 38

Neptune (♆).

Jan. 1	8 16 11	19 27 N.	2·7	5 46	13 35	21 24
31	8 12 45	19 38	2·7	3 43	11 33	19 23
Mar. 1	8 9 41	19 49	2·6	1 41	9 32	17 23
31	8 8 3	19 54	2·6	23 42	7 33	15 24
Apr. 30	8 8 24	19 54	2·6	21 44	5 35	13 26
May 30	8 10 42	19 47	2·5	10 49	3 40	11 31
June 29	8 14 29	19 36	2·5	17 55	1 45	9 35
July 29	8 18 59	19 22	2·5	16 0	23 48	7 36
Aug. 28	8 23 23	19 7	2·5	14 7	21 54	5 41
Sept. 27	8 26 49	18 55	2·6	12 15	20 0	3 45
Oct. 27	8 28 35	18 49	2·6	10 19	18 4	1 49
Nov. 26	8 28 18	18 50	2·6	8 20	16 5	23 50
Dec. 26	8 26 9	18 58	2·7	6 19	14 5	21 51

The times of rising and setting refer to the adjacent transit, irrespective of the date in the first column.

PLANETARY PHENOMENA, 1916.

Mercury.

	d h	d h	d h
Gr. elong. E. ...	Jan. 20 6;	May 12 4;	Sep. 9 5
„ W. ...	Mar. 1 12;	June 29 18;	Oct. 20 12
Inf. conj.	Feb. 4 20;	June 5 13;	Oct. 4 23
Sup. conj.	Apr. 14 9;	July 27 22;	Nov. 23 14
Stationary	Jan. 26 10;	Feb. 16 17;	May 24 21
	June 17 13;	Sep. 22 6;	Oct. 13 7

Venus.

	d h	d h
Gr. elong. E. ..	Apr. 23 23	......
„ W. ...	Sep. 12 2	......
Inf. conj.	July 3 8	......
Stationary	June 11 4;	July 24 23
Gr. brilliancy ...	May 27 1;	Aug. 9 4

Superior Planets.

	Conjunction.	Opposition.	Quadrature.		Stationary.	
	d h	d h	d h	d h	d h	d h
Mars	......	Feb. 9 14	May 14 12	......	Jan. 1 14;	Mar. 22 1
Jupiter ...	Apr. 1 2	Oct. 23 14	July 27 0	......	Aug. 25 7;	Dec. 21 2
Saturn......	July 12 9	Jan. 4 5	Mar. 30 11;	Oct. 23 12	Mar. 11 0;	Nov. 11 22
Uranus ...	Feb. 5 7	Aug. 10 6	May 10 3;	Nov. 8 2	May 24 15;	Oct. 25 20
Neptune ...	July 25 6	Jan. 22 3	Apr. 19 20;	Oct. 28 3	Apr. 9 23;	Nov. 7 0

ECLIPSES IN 1916.

In the year 1916 there will be three Eclipses of the Sun and two of the Moon.

I.—*A Partial Eclipse of the Moon, January* 19.

The Eclipse is visible in the North Atlantic Ocean, North and South America, and the Pacific Ocean. In England and the extreme west of Europe the beginning of the Eclipse is visible just before sunrise on January 20 (civil date).

	d	h	m
First contact with the Shadow	January 19	19	55·0 G.M.T.
Middle of Eclipse (magnitude=0·137) ...		20	39·5
Last contact with the Shadow		21	24·0

Angle from N. point:—first contact 175° to E., last contact 140° to W.
The Moon sets at Greenwich at 20^{h} 8^{m}.

II.—*A Total Eclipse of the Sun, February* 3.

The central line starts in the Pacific Ocean, crosses Columbia and Venezuela, and passes directly over the island of Guadeloupe into the Atlantic. The line just misses the Azores, and ends about 200 miles south of Ireland. The maximum duration of totality is 2^{m} 36^{s}; at Guadeloupe the duration is about 2^{m} 27^{s}.

The Central Eclipse begins February 3^{d} 2^{h} 29^{m} G.M.T. in Long. 121° 35′·6 W., Lat. 7° 20′·8 N., and ends at 5^{h} $31^{m}{\cdot}0$ in Long. 9° 50′·2 W., Lat. 49° 23′·8 N.

The Eclipse is partly visible as a Partial Eclipse in the British Isles, France, and Spain, and a Partial Eclipse is visible throughout most of N. America.

At Greenwich the Eclipse begins at 4^{h} 31^{m}, angle from N. point 242°. The Sun sets at 4^{h} 38^{m}.

At Montreal the Eclipse lasts from 10.29 A.M. to 12.29 P.M., Standard Time; angle from N. point of first contact 198°, last contact 100°; magnitude of eclipse 0·330.

III.—*A Partial Eclipse of the Moon, July* 14.

The Eclipse is visible in the Atlantic Ocean, North and South America, and the South Pacific Ocean. The beginning of the Eclipse is visible in England, South-west Europe, and Africa before sunrise on July 15 (civil date).

	d	h	m
First contact with Shadow	July 14	15	19·3 G.M.T.
Middle of Eclipse (magnitude=0·800)...		16	45·9
Last contact with the Shadow		18	12·5

Angle from N. point:—first contact 40° to E., last contact 70° to W.
The Moon sets at Greenwich at 15^{h} 59^{m}.

IV.—*An Annular Eclipse of the Sun, July* 29.

The central line passes through W. and S. Australia and Tasmania. Adelaide is on the central line, and Melbourne very close but just outside the limits of the annular phase. A Partial Eclipse is visible throughout the Malay Archipelago, Australia, and New Zealand. The circumstances at the principal Observatories are :—

	Perth.	Adelaide.	Melbourne.	Sydney.	Wellington.
	h m	h m	h m	h m	h m
Eclipse begins	19 58	22 13	23 2	23 12	1 41
Annular phase begins	...	23 57	...	...	...
Greatest phase	21 30	0 0	0 47	0 56	3 3
Annular phase ends	...	0 3	...	...	...
Eclipse ends	23 16	1 45	2 26	2 32	4 16
Magnitude	0·824	0·945	0·939	0·783	0·579
Angle from N. point. First contact ...	297°	300°	299°	293°	280°
Angle from N. point. Last contact ...	108°	124°	127°	137°	145°

(Standard Time—Civil date, July 30.)

V.—*A Partial Eclipse of the Sun, December* 24.

This is a very small Eclipse (magnitude, 0·011) visible only from a small region within the Antarctic Circle. For some places this Eclipse is visible at local midnight.

TABLE OF MEAN REFRACTIONS.

Z. D.	Mean Refraction.	Z. D.	Mean Refraction.	Z. D.	Mean Refraction.	Z. D.	Mean Refraction.
°	′ ″	°	′ ″	°	′ ″	°	′ ″
0	0·0	56	1 25·4	68	2 21·9	78	4 25·0
10	10·2	58	1 32·1	69	2 29·3	79	4 48·5
20	21·0	60	1 39·7	70	2 37·3	80	5 16·2
30	33·3	61	1 43·8	71	2 46·1	81	5 49·3
35	40·4	62	1 48·2	72	2 55·8	82	6 29·6
40	48·4	63	1 52·8	73	3 6·6	83	7 19·7
45	57·7	64	1 57·8	74	3 18·6	84	8 23·3
50	1 8·7	65	2 3·2	75	3 32·1	85	9 46·5
52	1 13·8	66	2 8·9	76	3 47·4		
54	1 19·3	67	2 15·2	77	4 4·9		

OCCULTATIONS, 1916. (VISIBLE AT GREENWICH.)

Date.	Star.	Mag.	Disap.		Reap.	
			M. T.	P.	M. T.	P.
Jan.			h m	°	h m	°
1	*b* Scorpii	4·7	18 25	50	19 1	345
13	26 Arietis	6·2	5 46	68	7 8	238
15	χ Tauri	5·3	12 5	132	12 58	225
16	W.Z.C. 341 ...	6·6	5 55	107	......	...
16	W.Z.C. 350 ...	6·8	10 9	148	......	...
17	W.Z.C. 421 ...	7·4	13 0	121	......	...
18	B.D.+24° 1470	7·0	8 49	129	......	...
18	ω Geminorum .	5·2	12 47	172	13 21	225
19	Piazzi vii. 179 .	6·3	5 59	73	6 58	302
21	W.Z.C. 646 ...	6·7	......	...	16 2	357
22	43 Leonis	6·3	17 16	172	18 1	255
24	W.Z.C. 771 ...	7·1	......	...	18 44	270
25	*q* Virginis	5·3	11 39	165	12 24	258
Feb.						
1	σ Sagittarii ...	2·1	0 5	113	0 55	210
6	22 Piscium......	5·8	8 39	105	......	...
7	Lalande 1082...	6·5	9 27	20	10 6	293
10	W.Z.C. 189 ...	6·9	11 53	49	......	...
13	139 Tauri	4·7	14 46	138	15 29	240
14	ε Geminorum...	3·2	11 3	112	12 19	280
14	W.Z.C. 476 ...	6·7	16 44	149	......	...
15	B.D.+23° 1744	6·4	9 10	125	10 29	270
17	81 Cancri	6·4	9 33	132	10 53	288
19	35 Sextantis ...	6·1	7 56	113	9 2	302
20	Piazzi xi. 126...	6·2	13 52	84	14 48	350
21	W.Z.C. 805 ...	6·7	......	...	16 8	355
21	B.D.−8° 3366 .	7·0	......	...	18 21	355
21	*q* Virginis	5·3	19 11	48	......	...
24	W.Z.C. 955 ...	6·8	......	...	18 15	290
25	Lacaille 6719...	6·9	......	...	18 8	251
26	Lalande 31226 .	6·1	16 22	60	17 20	312
26	Lacaille 7175...	7·0	......	..	18 9	310
28	χ Sagittarii ...	4·9	19 17	6	19 44	325
Mar.						
9	16 Tauri.........	5·4	10 15	68	11 12	280
9	17 Tauri.........	3·8	10 17	112	11 11	240
9	20 Tauri.........	4·1	10 46	55	11 35	298
9	*q* Tauri	4·3	10 48	10	11 4	340
9	W.Z.C. 224 ...	6·8	11 24	119	......	...
9	B.D.+23° 540 .	7·0	11 25	80	......	...
9	η Tauri	3·0	11 30	123	12 13	227
9	28 Tauri.........	5·2	12 11	122	......	...
9	27 Tauri.........	3·7	12 23	157	12 40	193
11	125 Tauri	5·1	14 20	158	14 44	213
13	48 Geminorum.	5·8	7 43	50	8 31	342
13	58 Geminorum.	6·0	14 2	115	14 58	280
14	Neptune.........	7·7	14 16	145	15 6	262
20	Lalande 24034 .	6·0	10 6	122	11 15	303

Date.	Star.	Mag.	Disap.		Reap.	
			M. T.	P.	M. T.	P.
Mar.			h m	°	h m	°
20	B.D.−11° 3398	6·7	......	...	13 5	314
23	*b* Scorpii.........	4·7	14 42	80	15 50	312
23	4 Scorpii	5·7	17 19	138	18 15	238
28	21 Capricorni...	6·5	16 22	73	17 29	245
Apr.						
8	139 Tauri	4·7	5 46	117	7 3	260
9	W.Z.C. 476 ...	6·7	8 21	130	......	...
10	W.Z.C. 538 ...	7·0	13 12	40	......	...
16	B.D.−8° 3366 .	7·0	8 20	159	......	...
16	*q* Virginis	5·3	9 38	134	10 50	295
May						
5	B.D.+25° 978 .	6·6	9 36	118	......	...
6	Piazzi vi. 165 ..	6·5	8 18	111	9 20	277
6	B.D.+24° 1343	6·8	9 17	80	......	...
8	*d'* Cancri	5·9	11 32	136	12 22	268
11	W.Z.C. 705 ...	6·6	12 44	351	......	...
12	Piazzi xi. 77 ...	6·3	11 39	107	12 43	312
17	π Scorpii	3·0	9 58	164	10 35	229
17	Piazzi xv. 237...	4·9	12 1	34	12 27	351
17	Piazzi xv. 265...	5·5	14 7	105	15 16	258
20	W.Z.C. 1281 ...	6·9	......	...	12 15	288
20	49 Sagittarii ...	5·5	13 38	46	14 41	285
23	Bradley 2930 ...	6·0	14 49	100	15 43	201
25	22 Piscium......	5·8	13 50	39	14 45	264
June						
4	Piazzi vii. 272 .	6·3	7 37	187	7 56	222
5	W.Z.C. 608 ...	7·2	8 33	94	......	...
9	W.Z.C. 771 ...	7·1	10 51	44	......	...
15	Piazzi xvii. 223.	6·2	12 48	359	12 53	353
16	Lalande 35371 .	6·4	14 38	27	15 26	297
16	Piazzi xviii. 261	5·8	15 30	41	16 25	283
21	λ Piscium	4·6	15 16	88	16 17	204
23	W.Z.C. 70	7·1	......	...	12 53	245
25	ε Arietis (mean)	4·6	15 40	91	16 39	224
26	23 Tauri.........	4·3	13 50	25	14 24	305
26	27 Tauri.........	3·7	14 55	44	15 45	282
26	28 Tauri.........	5·2	15 6	21	15 40	306
27	B.D.+24° 674 .	6·8	......	...	14 35	238
July						
11	Piazzi xv. 265...	5·5	10 57	90	12 5	280
14	49 Sagittarii ...	5·5	9 31	69	10 39	266
15	υ Capricorni ...	5·3	15 56	11	16 35	292
16	Lalande 41601 .	6·8	......	...	9 28	266
16	B.D.−14° 6039	7·0	......	...	11 30	225
17	B.D.−8° 5873 .	7·0	......	...	12 49	250
17	Lalande 43974 .	6·1	14 47	36	15 53	254
23	66 Arietis	6·1	11 22	114	12 0	212

"W.Z.C." denotes the Washington Catalogue of Zodiacal Stars (American Ephemeris Papers, vol. viii).

The angles (P) are reckoned from the true N. point in the direction N., E., S., W., *i. e.* from the bottom of the Moon's inverted image towards the right.

Occultations, 1916 (*continued*).

Date.	Star.	Mag.	Disap.		Reap.	
			M.T.	P.	M.T.	P.
Aug.			h m	°	h m	°
5	87 Virginis......	5·8	8 0	139	9 1	262
9	Piazzi xvii. 223.	6·2	9 7	3	9 19	345
9	W.Z.C. 1151 ...	6·8	9 36	52	......	...
10	Lalande 35371 .	6·4	11 48	46	12 46	278
10	Piazzi xviii. 261	5·8	12 41	58	......	...
14	W.Z.C. 1530 ...	6·6	......	...	13 38	308
15	λ Piscium	4·6	8 26	63	9 24	240
16	Lalande 1082 .	6·5	13 26	15	14 21	277
24	Saturn	0·4	21 42	82	22 52	325
Sept.						
8	*υ* Capricorni ...	5·3	12 2	26	12 53	278
9	B.D.−14° 6039	7·0	7 14	94	......	...
10	B.D.−8° 5873 .	7·0	8 34	46	......	...
10	Lalande 43974 .	6·1	11 37	36	12 41	257
14	Piazzi ii. 257 ...	6·5	16 7	29	17 5	286
15	ε Arietis (mean)	4·6	14 22	102	15 23	210
15	W.Z.C. 176 ...	6·7	......	...	15 29	278
16	W.Z.C. 228 ...	6·6	......	...	12 48	253
16	B.A.C. 1186 ...	6·4	......	...	12 53	201
16	27 Tauri.........	3·7	12 4	30	12 55	292
16	28 Tauri.........	5·2	12 24	358	12 44	324
16	B.D.+23° 569 .	6·8	......	...	13 16	234
17	B.D.+24° 674 .	6·8	......	...	10 49	267
18	B.D.+25° 941 .	6·8	......	...	15 27*	186
19	Piazzi vi. 165...	6·5	15 12	72	16 24	295
20	B.D.+22° 1687	6·7	......	...	15 52	261
Oct.						
1	Piazzi xv. 237 .	4·9	4 52	104	6 4	269
4	Piazzi xix. 22...	6·1	8 0	106	8 56	216
9	22 Piscium......	5·8	9 36	127	9 58	163
11	101 Piscium ...	6·2	9 40	56	10 51	242
13	66 Arietis	6·1	12 12	89	13 25	231
18	Piazzi vii. 272 .	6·3	15 20	126	16 37	269
19	W.Z.C. 608 ...	7·2	......	...	17 59	339
21	B.A.C. 3529 ...	7·0	......	...	17 7	287
Nov.						
2	Piazzi xx. 386. .	5·7	8 36	9	9 17	292
3	W.Z.C. 1455 ...	7·0	4 57	83	......	...
3	λ Capricorni ...	5·5	5 23	15	6 15	284
3	W.Z.C. 1460 ...	6·8	9 6	50	......	...
3	Lalande 42647 .	6·5	9 46	24	10 39	275
Nov.			h m	°	h m	°
4	W.Z.C. 1515 ...	7·0	7 26	63	......	...
4	W.Z.C. 1520 ...	6·6	11 6	76	......	...
5	W.Z.C. 1576 ...	6·6	9 25	101	......	...
6	W.Z.C. 20	7·2	9 57	18	......	...
7	W.Z.C. 70	7·1	6 48	69	......	...
9	ε Arietis (mean)	4·6	8 9	349	8 22	326
10	Bradley 522 ...	5·5	5 7	52	5 55	278
10	36 Tauri.........	5·6	13 15	124	14 14	219
12	W.Z.C. 401 ...	7·7	......	...	13 18	259
13	Lalande 12660 .	6·9	......	...	8 25	225
13	Lalande 13171 .	5·8	15 17	63	16 18	327
14	63 Geminorum .	5·3	......	...	8 4	270
14	79 Geminorum .	6·3	17 28	180	17 59	227
18	W.Z.C. 705 ..	6·6	......	...	13 39	287
19	Piazzi xi. 77 ...	6·3	......	...	13 55	326
Dec.						
1	Piazzi xxii. 81. .	6·0	3 41	66	4 52	229
2	Piazzi xxiii. 68 .	6·4	9 52	91	10 46	207
2	9 Piscium	6·4	12 15	26	......	...
6	*μ* Arietis.........	5·7	7 16	104	8 14	208
6	ε Arietis (mean)	4·6	16 44	50	17 30	294
7	W.Z.C. 207 ...	6·7	7 38	62	......	...
7	W.Z.C. 228 ...	6·6	14 43	48	......	...
7	B.A.C. 1186 ...	6·4	14 58	85	......	...
7	B.D.+23° 569 .	6·8	15 12	54	......	...
8	62 Tauri.........	6·1	4 0	113	4 44	221
8	B.D.+24° 674 .	6·8	11 57	57	......	...
9	118 Tauri	5·4	8 46	112	9 53	239
9	132 Tauri	5·0	19 40	121	20 13	228
10	Lalande 12660 .	6·9	......	...	18 26	273
11	W.Z.C. 500 ...	7·4	......	...	9 37	205
11	δ Geminorum .	3·5	11 26	109	12 47	277
11	Piazzi vii. 97 ...	6·4	15 53	98	17 6	306
11	63 Geminorum.	5·3	16 27	99	17 38	305
13	54 Cancri	6·3	8 15	102	9 15	289
14	B.D.+11° 2071	7·0	......	...	10 31	315
15	Lalande 20142 .	6·5	......	...	11 3	293
15	W.Z.C. 699 ...	7·2	......	...	16 54	351
21	Lalande 28274 .	6·3	18 15	128	19 17	269
27	B.D.−15° 5908	6·3	4 23	31	......	...
28	W.Z.C. 1476 ...	7·0	5 48	20	......	...
31	Lalande 1082...	6·5	3 59	67	5 12	230

* A graze; occultation not certain.

"W.Z.C." denotes the Washington Catalogue of Zodiacal Stars (American Ephemeris Papers, vol. viii.).

The angles (P) are reckoned from the true N. point in the direction N., E., S., W., *i. e.* from the bottom of the Moon's inverted image towards the right.

JUPITER'S SATELLITES, 1916.

Phenomena.

e, Signifies Ec. dis.; E, Ec. re.; *o*, Occ. dis.; O, Occ. re.; *t*, Tr. Ing.; T, Tr. Egr.

January.

d	h	m	
1	3	30	ii. *o*.
	8	54	ii. E.
	11	26	i. *o*.
	14	57	i. E.
2	*7	38	iii. *t*.
	*8	36	i. *t*.
	10	40	iii. T.
	10	50	i. T.
	22	39	ii. *t*.
3	1	26	ii. T.
	*5	56	i. *o*.
	*9	26	i. E.
	13	20	iv. *o*.
	16	35	iv. O.
4	2	14	iv. *e*.
	3	6	i. *t*.
	3	34	iv. E.
	5	20	i. T.
	16	52	ii. *o*.
	22	13	ii. E.
5	0	25	i. *o*.
	3	55	i. E.
	21	36	i. *t*.
	21	49	iii. *o*.
	23	50	i. T.
6	0	53	iii. O.
	3	3	iii. *e*.
	*5	45	iii. E.
	12	1	ii. *t*.
	14	47	ii. T.
	18	55	i. *o*.
	22	24	i. E.
7	16	5	i. *t*.
	18	20	i. T.
8	*6	15	ii. *o*.
	11	32	ii. E.
	13	25	i. *o*.
	16	53	i. E.
9	10	35	i. *t*.
	11	54	iii. *t*.
	12	49	i. T.
	14	55	iii. T.
10	1	23	ii. *t*.
	4	9	ii. T.
	*7	55	i. *o*
	11	21	i. E.
11	*5	5	i. *t*.
	*7	19	i. T.
	19	38	ii. *o*.
12	0	49	iv. *t*.
	0	52	ii. E.

Jan. (con.).

d	h	m	
12	2	24	i. *o*.
	3	57	iv. T.
	*5	50	i. E.
	23	35	i. *t*.
13	1	49	i. T.
	2	6	iii. *o*.
	*5	9	iii. O.
	*7	6	iii. *e*.
	9	46	iii. E.
	14	45	ii. *t*.
	17	31	ii. T.
	20	54	i. *o*.
14	0	19	i. E.
	18	5	i. *t*.
	20	19	i. T.
15	*9	1	ii. *o*.
	14	11	ii. E.
	15	24	i. *o*.
	18	48	i. E.
16	12	35	i. *t*.
	14	49	i. T.
	16	13	iii. *t*.
	19	14	iii. T.
17	4	7	ii. *t*.
	*6	53	ii. T.
	9	54	i. *o*.
	13	17	i. E.
18	*7	5	i. *t*.
	*9	19	i. T.
	22	25	ii. *o*.
19	3	30	ii. E.
	4	24	i. *o*.
	*7	46	i. E.
20	1	35	i. *t*.
	3	49	i. T.
	*6	26	iii. *o*.
	*9	6	iv. *o*.
	*9	28	iii. O.
	11	8	iii. *e*.
	12	13	iv. O.
	13	47	iii. E.
	17	30	ii. *t*.
	20	16	ii. T.
	20	48	iv. *e*.
	21	32	iv. E.
	22	54	i. *o*.
21	2	14	i. E.
	20	5	i. *t*.
	22	20	i. T.
22	11	48	ii. *o*.
	16	49	ii. E.

Jan. (con.).

d	h	m	
22	17	24	i. *o*.
	20	43	i. E.
23	14	35	i. *t*.
	16	50	i. T.
	20	36	iii. *t*.
	23	35	iii. T.
24	*6	53	ii. *t*.
	9	39	ii. T.
	11	54	i. *o*.
	15	12	i. E.
25	*9	5	i. *t*.
	11	20	i. T.
26	1	13	ii. *o*.
	*6	9	ii. E.
	*6	24	i. *o*.
	9	41	i. E.
27	3	36	i. *t*.
	*5	50	i. T.
	10	49	iii. *o*.
	13	49	iii. O.
	15	10	iii. *e*.
	17	48	iii. E.
	20	16	ii. *t*.
	23	2	ii. T.
28	0	55	i. *o*.
	4	10	i. E.
	20	56	iv. *t*.
	22	6	i. *t*.
	23	53	iv. T.
29	0	20	i. T.
	14	37	ii. *o*.
	19	25	i. *o*.
	19	28	ii. E.
	22	38	i. E.
30	16	36	i. *t*.
	18	51	i. T.
31	1	0	iii. *t*.
	3	59	iii. T.
	9	39	ii. *t*.
	12	25	ii. T.
	13	55	i. *o*.
	17	7	i. E.

February.

d	h	m	
1	11	6	i. *t*.
	13	21	i. T.
2	4	3	ii. *o*.
	*8	25	i. *o*.
	*8	48	ii. E.
	11	36	i. E.

Feb. (con.).

d	h	m	
3	*5	37	i. *t*.
	*7	51	i. T.
	15	14	iii. *o*.
	18	13	iii. O.
	19	13	iii. *e*.
	21	50	iii. E.
	23	3	ii. *t*.
4	1	48	ii. T.
	2	55	i. *o*.
	*6	5	i. E.
5	0	7	i. *t*.
	2	22	i. T.
	17	28	ii. *o*.
	21	26	i. *o*.
	22	6	ii. E.
6	0	33	i. E.
	*5	27	iv. *o*.
	*8	20	iv. O.
	18	38	i. *t*.
	20	52	i. T.
7	*5	27	iii. *t*.
	*8	24	iii. T.
	12	27	ii. *t*.
	15	12	ii. T.
	15	56	i. *o*.
	19	2	i. E.
8	13	8	i. *t*.
	15	23	i. T.
9	*6	54	ii. *o*.
	10	26	i. *o*.
	11	26	ii. E.
	13	31	i. E.
10	*7	39	i. *t*.
	9	53	i. T.
	19	41	iii. *o*.
	22	39	iii. O.
	23	16	iii. *e*.
11	1	51	ii. *t*.
	1	51	iii. E.
	4	36	ii. T.
	4	57	i. *o*.
	*8	0	i. E.
12	2	9	i. *t*.
	4	24	i. T.
	20	19	ii. *o*.
	23	27	i. *o*.
13	0	45	ii. E.
	2	29	i. E.
	20	40	i. *t*.
	22	54	i. T.
14	9	55	iii. *t*.

Feb. (con.).

d	h	m	
14	12	50	iii. T.
	15	15	ii. *t*.
	17	36	iv. *t*.
	17	57	i. *o*.
	18	0	ii. T.
	20	15	iv. T.
	20	57	i. E.
15	15	10	i. *t*.
	17	25	i. T.
16	9	45	ii. *o*.
	12	28	i. *o*.
	14	5	ii. E.
	15	26	i. E.
17	9	41	i. *t*.
	11	55	i. T.
18	0	11	iii. *o*.
	3	6	iii. O.
	3	19	iii. *e*.
	4	39	ii. *t*.
	*5	52	iii. E.
	*6	58	i. *o*.
	*7	24	ii. T.
	9	55	i. E.
19	4	11	i. *t*.
	*6	26	i. T.
	23	11	ii. *o*.
20	1	28	i. *o*.
	3	24	ii. E.
	4	24	i. E.
	22	42	i. *t*.
21	0	56	i. T.
	14	24	iii. *t*.
	17	18	iii. T.
	18	3	ii. *t*.
	19	59	i. *o*.
	20	49	ii. T.
	22	52	i. E.
22	17	12	i. *t*.
	19	27	i. T.
23	2	17	iv. *o*.
	4	48	iv. O.
	12	38	ii. *o*.
	14	29	i. *o*.
	16	43	ii. E.
	17	21	i. E.
24	11	43	i. *t*.
	13	58	i. T
25	4	41	iii. *o*.
	*7	28	ii. *t*.
	9	0	i. *o*.
	9	53	iii. E.

Feb. (con.).

d	h	m	
25	10	13	ii. T.
	11	50	i. E.
26	*6	14	i. *t*.
	8	28	i. T.
27	2	4	ii. *o*.
	3	30	i. *o*.
	*6	2	ii. E.
	*6	18	i. E.
28	0	44	i. *t*.
	2	59	i. T.
	18	56	iii. *t*.
	20	53	ii. *t*.
	21	47	iii. T.
	22	1	i. *o*.
	23	38	ii. T.
29	0	47	i. E.
	19	15	i. *t*.
	21	29	i. T.

May.

d	h	m	
1	0	0	i. O.
	3	1	ii. *e*.
	6	47	ii. O.
	19	8	i. *t*.
	21	21	i. T.
2	15	46	i. *e*.
	18	31	i. O.
	22	24	ii. *t*.
3	1	4	ii. T.
	11	59	iii. *t*.
	13	39	i. *t*.
	14	22	iii. T.
	*15	51	i. T.
4	10	15	i. *e*.
	13	1	i. O.
	*16	20	ii. *e*.
	20	13	ii. O.
5	8	9	i. *t*.
	10	21	i. T.
6	4	43	i. *e*.
	7	31	i. O.
	11	48	ii. *t*.
	14	28	ii. T.
	23	38	iii. *e*.
7	1	57	iii. E.
	2	7	iii. *o*.
	2	40	i. *t*.
	4	29	iii. O.
	4	52	i. T.
	23	12	i. *e*.

* Denotes that Jupiter is above, and the Sun below, the horizon of Greenwich.

May (con.).

d	h	m	
8	2	2	i. O.
	5	39	ii. *e*.
	9	38	ii. O.
	21	10	i. *t*.
	23	22	i. T.
9	17	40	i. *e*.
	20	32	i. O.
10	1	13	ii. *t*.
	3	53	ii. T.
	*15	40	i. *t*.
	16	30	iii. *t*.
	17	52	i. T.
	18	49	iii. T.
11	12	9	i. *e*.
	15	2	i. O.
	18	57	ii. *e*.
	23	3	ii. O.
12	10	11	i. *t*.
	12	23	i. T.
13	6	37	i. *e*.
	9	32	i. O.
	14	37	ii. *t*.
	17	17	ii. T.
14	3	40	iii. *e*.
	4	41	i. *t*.
	5	58	iii. E.
	6	37	iii. *o*.
	6	53	i. T.
	8	56	iii. O.
15	1	6	i. *e*.
	4	2	i. O.
	8	16	ii. *e*.
	12	28	ii. O.
	23	11	i. *t*.
16	1	23	i. T.
	19	34	i. *e*.
	22	32	i. O.
17	4	2	ii. *t*.
	6	41	ii. T.
	17	42	i. *t*.
	19	53	i. T.
	21	0	iii. *t*.
	23	15	iii. T.
18	14	3	i. *e*.
	17	3	i. O.
	21	35	ii. *e*.
19	1	52	ii. O.
	12	12	i. *t*.
	14	23	i. T.
20	8	32	i. *e*.
	11	33	i. O.
	17	26	ii. *t*.
	20	5	ii. T.
21	6	42	i. *t*.
	7	42	iii. *e*.
	8	53	i. T.
	9	58	iii. E.
	11	6	iii. *o*.
	13	21	iii. O.
22	3	0	i. *e*.
	6	3	i. O.

May (con.).

d	h	m	
22	10	53	ii. *e*.
	*15	17	ii. O.
23	1	12	i. *t*.
	3	23	i. T.
	21	29	i. *e*.
24	0	33	i. O.
	6	50	ii. *t*.
	9	28	ii. T.
	19	42	i. *t*.
	21	53	i. T.
25	1	28	iii. *t*.
	3	39	iii. T.
	15	57	i. *e*.
	19	3	i. O.
26	0	11	ii. *e*
	4	41	ii. O.
	14	13	i. *t*.
	16	24	i. T.
27	10	26	i. *e*.
	13	33	i. O.
	20	14	ii. *t*.
	22	52	ii. T.
28	8	43	i. *t*.
	10	53	i. T.
	11	44	iii. *e*.
	13	58	iii. E.
	*15	34	iii. *o*.
	17	44	iii. O.
29	4	54	i. *e*.
	8	3	i. O.
	13	29	ii. *e*.
	18	4	ii. O.
30	3	13	i. *t*.
	5	23	i. T.
	23	23	i. *e*.
31	2	33	i. O.
	9	38	ii. *t*.
	12	15	ii. T.
	21	43	i. *t*.
	23	53	i. T.

June.

d	h	m	
1	5	55	iii. *t*.
	8	1	iii. T.
	17	51	i. *e*.
	21	3	i. O.
2	2	48	ii. *e*.
	7	28	ii. O.
	16	13	i. *t*.
	18	23	i. T.
3	12	20	i. *e*.
	*15	32	i. O.
	23	2	ii. *t*.
4	1	39	ii. T.
	10	43	i. *t*.
	12	53	i. T.
	*15	45	iii. *e*.
	17	58	iii. E.
	19	59	iii. *o*.
	22	5	iii. O.

June (con.).

d	h	m	
5	6	48	i. *e*.
	10	2	i. O.
	16	6	ii. *e*.
	20	51	ii. O.
6	5	13	i. *t*.
	7	23	i. T.
7	1	17	i. *e*.
	4	32	i. O.
	12	25	ii. *t*.
	*15	2	ii. T.
	23	42	i. *t*.
8	1	53	i. T.
	10	20	iii. *t*.
	12	22	iii. T.
	19	45	i. *e*.
	23	2	i. O.
9	5	24	ii. *e*.
	10	14	ii. O.
	18	12	i. *t*.
	20	22	i. T.
10	*14	14	i. *e*.
	17	32	i. O.
11	1	48	ii. *t*.
	4	24	ii. T.
	12	42	i. *t*.
	*14	52	i. T.
	19	46	iii. *e*.
	21	58	iii. E.
12	0	22	iii. *o*.
	2	24	iii. O.
	8	42	i. *e*.
	12	1	i. O.
	18	42	ii. *e*.
	23	37	ii. O.
13	7	12	i. *t*.
	9	22	i. T.
14	3	11	i. *e*.
	6	31	i. O.
	*15	11	ii. *t*.
	17	47	ii. T.
15	1	41	i. *t*.
	3	51	i. T.
	*14	43	iii. *t*.
	16	40	iii. T.
	21	39	i. *e*.
16	1	1	i. O.
	8	1	ii. *e*.
	12	59	ii. O.
	20	11	i. *t*.
	22	21	i. T.
17	16	8	i. *e*.
	19	30	i. O.
18	4	34	ii. *t*.
	7	9	ii. T.
	*14	41	i. *t*.
	16	50	i. T.
	23	47	iii. *e*.
19	1	57	iii. E.
	4	43	iii. *o*.
	6	41	iii. O.
	10	37	i. *e*.

July (con.).

d	h	m	
19	*14	0	i. O.
	21	18	ii. *e*.
20	2	21	ii. O.
	9	10	i. *t*.
	11	20	i. T.
21	5	5	i. *e*.
	8	29	i. O.
	17	56	ii. *t*.
	20	31	ii. T.
22	3	40	i. *t*.
	5	49	i. T.
	19	4	iii. *t*.
	20	56	iii. T.
	23	34	i. *e*.
23	2	59	i. O.
	10	37	ii. *e*.
	*15	42	ii. O.
	22	9	i. *t*.
24	0	9	i. T.
	18	2	i. *e*.
	21	28	i. O.
25	7	18	ii. *t*.
	9	53	ii. T.
	16	39	i. *t*.
	18	48	i. T.
26	3	48	iii. *e*.
	5	57	iii. E.
	9	2	iii. *o*.
	10	55	iii. O.
	12	31	i. *e*.
	15	58	i. O.
	23	54	ii. *e*.
27	5	3	ii. O.
	11	8	i. *t*.
	*13	17	i. T.
28	6	59	i. *e*.
	10	27	i. O.
	20	40	ii. *t*.
	23	14	ii. T.
29	5	38	i. *t*.
	7	47	i. T.
	23	22	iii. *t*.
30	1	9	iii. T.
	1	28	i. *e*.
	4	56	i. O.
	*13	12	ii. *e*.
	18	24	ii. O.

July.

d	h	m	
1	0	7	i. *t*.
	2	16	i. T.
	19	56	i. *e*.
	23	26	i. O.
2	10	2	ii. *t*.
	*12	35	ii. T.
	18	36	i. *t*.
	20	45	i. T.
3	7	49	iii. *e*.
	9	57	iii. E.
	*13	19	iii. *o*.

July (con.).

d	h	m	
3	*14	25	i. *e*.
	*15	6	iii. O.
	17	55	i. O.
4	2	30	ii. *e*.
	5	8	ii. E.
	5	10	ii. *o*.
	7	44	ii. O.
	*13	5	i. *t*.
	*15	14	i. T.
5	8	53	i. *e*.
	12	24	i. O.
	23	23	ii. *t*.
6	1	56	ii. T.
	7	34	i. *t*.
	9	43	i. T.
7	3	22	i. *e*.
	3	36	iii. *t*.
	5	18	iii. T.
	6	53	i. O.
	*15	48	ii. *e*.
	18	26	ii. E.
	18	30	ii. *o*.
	21	4	ii. O.
8	2	4	i. *t*.
	4	12	i. T.
	21	50	i. *e*.
9	1	22	i. O.
	*12	43	ii. *t*.
	*15	16	ii. T.
	20	33	i. *t*.
	22	41	i. T.
10	*11	50	iii. *e*.
	*13	57	iii. E.
	16	19	i. *e*.
	17	32	iii. *o*.
	19	14	iii. O.
	19	51	i O.
11	5	6	ii. *e*.
	7	43	ii. E.
	7	50	ii. *o*.
	10	24	ii. O.
	*15	2	i. *t*.
	17	10	i. T.
12	10	47	i. *e*.
	*14	20	i. O.
13	2	4	ii. *t*.
	4	37	ii. T.
	9	30	i. *t*.
	*11	39	i. T.
14	5	16	i. *e*.
	7	47	iii. *t*.
	8	49	i. O.
	9	24	iii. T.
	18	23	ii. *e*.
	21	1	ii. E.
	21	10	ii. *o*.
	23	43	ii. O.
15	3	59	i. *t*.
	6	8	i. T.
	23	44	i. *e*.
16	3	18	i. O.

July (con.).

d	h	m	
16	*15	24	ii. *t*.
	17	56	ii. T.
	22	28	i. *t*.
17	0	36	i. T.
	*15	52	iii. *e*.
	17	57	iii. E.
	18	13	i. *e*.
	21	42	iii. *o*.
	21	47	i. O.
	23	19	iii. O.
18	7	41	ii. *e*.
	10	18	ii. E.
	10	29	ii. *o*.
	*13	1	ii. O.
	16	57	i. *t*.
	19	5	i. T.
19	*12	41	i. *e*.
	16	16	i. O.
20	4	44	ii. *t*.
	7	15	ii. T.
	*11	26	i. *t*.
	*13	34	i. T.
21	7	10	i. *e*.
	10	44	i. O.
	*11	55	iii. *t*.
	*13	25	iii. T.
	20	59	ii. *e*.
	23	36	ii. E.
	23	47	ii. *o*.
22	2	19	ii. O.
	5	54	i. *t*.
	8	2	i. T.
23	1	38	i. *e*.
	5	13	i. O.
	18	3	ii. *t*.
	20	34	ii. T.
24	0	23	i. *t*.
	2	30	i. T.
	19	53	iii. *e*.
	20	7	i. *e*.
	21	57	iii. E.
	23	42	i. O.
25	1	47	iii. *o*.
	3	20	iii. O.
	10	16	ii. *e*.
	*12	53	ii. E.
	*13	5	ii. *o*.
	*15	37	ii. O.
	18	51	i. *t*.
	20	59	i. T.
26	*14	35	i. *e*.
	18	10	i. O.
27	7	22	ii. *t*.
	9	53	ii. T.
	*13	20	i. *t*.
	*15	27	i. T.
28	9	4	i. *e*.
	*12	39	i. O.
	*15	58	iii. *t*.
	17	25	iii. T.
	23	34	ii. *e*.

July (con.).

d	h	m	
29	2	11	ii. E.
	2	23	ii. *o*.
	4	54	ii. O.
	7	48	i. *t*.
	9	56	i. T.
30	3	32	i. *e*.
	7	7	i. *o*.
	20	39	ii. *t*.
	23	10	ii. T.
31	2	17	i. *t*.
	4	24	i. T.
	22	1	i. *e*.
	23	54	iii. *e*.

August.

d	h	m	
1	1	36	i. O.
	1	57	iii. E.
	5	49	iii. *o*.
	7	16	iii. O.
	*12	51	ii. *e*.
	*15	28	ii. E.
	*15	39	ii. *o*.
	18	10	ii. O.
	20	45	i. *t*.
	22	52	i. T.
2	16	30	i. *e*.
	20	4	i. O.
3	9	57	ii. *t*.
	*12	28	ii. T.
	*15	13	i. *t*.
	17	20	i. T.
4	*10	58	i. *e*.
	*14	32	i. O.
	19	58	iii. *t*.
	21	19	iii. T.
5	2	9	ii. *e*.
	4	45	ii. E.
	4	56	ii. *o*.
	7	26	ii. O.
	9	41	i. *t*.
	*11	48	i. T.
6	5	27	i. *e*.
	9	0	i. O.
	23	14	ii. *t*.
7	1	44	ii. T.
	4	9	i. *t*.
	6	16	i. T.
	23	55	i. *e*.
8	3	28	i. O.
	3	54	iii. *e*.
	5	56	iii. E.
	9	46	iii. *o*.
	*11	8	iii. O.
	*15	26	ii. *e*.
	18	3	ii. E.
	18	11	ii. *o*.
	20	42	ii. O.
	22	37	i. *t*.
9	0	44	i. T.
	18	24	i. *e*.

Aug. (con.).

d	h	m	
9	21	56	i. O.
10	*12	31	ii. *t*.
	*15	1	ii. T.
	17	5	i. *t*.
	19	12	i. T.
11	*12	52	i. *e*.
	*16	24	i. O.
	23	54	iii. *t*.
12	1	10	iii. T.
	4	44	ii. *e*.
	7	20	ii. E.
	7	27	ii. *o*.
	*9	57	ii. O.
	*11	33	i. *t*.
	*13	40	i. T.
13	7	21	i. *e*.
	*10	52	i. O.
14	1	47	ii. *t*.
	4	16	ii. T.
	6	1	i. *t*.
	8	8	i. T.
15	1	49	i. *e*.
	5	20	i. O.
	7	55	iii. *e*.
	*9	56	iii. E.
	*13	39	iii. *o*.
	14	56	iii. O.
	18	1	ii. *e*.
	20	37	ii. E.
	20	41	ii. *o*.
	23	11	ii. O.
16	0	28	i. *t*.
	2	36	i. T.
	20	18	i. *e*.
	23	48	i. O.
17	*15	3	ii. *t*.
	17	32	ii. T.
	18	56	i. *t*.
	21	3	i. T.
18	*14	46	i. *e*.
	18	15	i. O.
19	3	44	iii. *t*.
	4	55	iii. T.
	7	18	ii. *e*.
	*9	54	ii. E.
	*9	55	ii. *o*.
	*12	25	ii. O.
	*13	23	i. *t*.
	*15	31	i. T.
20	*9	15	i. *e*.
	12	43	i. O.
21	4	18	ii. *t*.
	6	47	ii. T.
	7	51	i. *t*.
	*9	58	i. T.
22	3	44	i. *e*.
	7	11	i. O.
	*11	57	iii. *e*.
	*13	56	iii. E.
	17	28	iii. *o*.
	18	39	iii. O.

Aug. (con.).

d	h	m	
22	20	36	ii. *e*.
23	1	38	ii. O.
	2	18	i. *t*.
	4	26	i. T.
	22	12	i. *e*.
24	1	38	i. O.
	17	32	ii. *t*.
	20	1	ii. T.
	20	46	i. *t*.
	22	53	i. T.
25	*16	41	i. *e*.
	20	5	i. O.
26	7	30	iii. *t*.
	8	35	iii. T.
	*9	53	ii. *e*.
	*14	50	ii. O.
	*15	13	i. *t*.
	17	20	i. T.
27	11	9	i. *e*.
	14	33	i. O.
28	6	46	ii. *t*.
	*9	15	ii. T.
	*9	40	i. *t*.
	*11	47	i. T.
29	5	38	i. *e*.
	*9	0	i. O.
	*15	58	iii. *e*.
	17	57	iii. E.
	21	11	iii. *o*.
	22	18	iii. O.
	23	10	ii. *e*.
30	4	2	ii. O.
	4	7	i. *t*.
	6	14	i. T.
31	0	6	i. *e*.
	3	27	i. O.
	19	59	ii. *t*.
	22	28	ii. T.
	22	34	i. *t*.

September.

d	h	m	
1	0	42	i. T.
	18	35	i. *e*.
	21	54	i. O.
2	*11	10	iii. *t*.
	*12	11	iii. T.
	*12	28	ii. *e*.
	*17	1	i. *t*.
	*17	14	ii. O.
	19	9	i. T.
3	13	4	i. *e*.
	16	21	i. O.
4	*9	12	ii. *t*.
	*11	28	i. *t*.
	*11	40	ii. T.
	*13	35	i. T.
5	7	32	i. *e*.
	*10	48	i. O.
	20	0	iii. *e*.
	21	57	iii. E.

Sept. (con.).

d	h	m	
6	0	50	iii. *o*.
	1	45	ii. *e*.
	1	52	iii. O.
	5	55	i. *t*.
	6	24	ii. O.
	8	2	i. T.
7	2	1	i. *t*.
	5	15	i. O.
	22	24	ii. *t*.
8	0	22	i. *t*.
	0	53	ii. T.
	2	29	i. T.
	20	30	i. *e*.
	23	42	i. O.
9	*14	45	iii. *t*.
	*15	2	ii. *e*.
	*15	42	iii. T.
	18	49	i. *t*.
	19	35	ii. O.
	20	56	i. T.
10	*14	58	i. *e*.
	18	9	i. O.
11	*11	35	ii. *t*.
	*13	15	i. *t*.
	*14	4	ii. T.
	*15	22	i. T.
12	*9	27	i. *e*.
	*12	36	i. O.
13	*0	1	iii. *e*.
	1	57	iii. E.
	4	20	ii. *e*.
	4	23	iii. *o*.
	5	22	iii. O.
	*7	42	i. *t*.
	*8	45	ii. O.
	*9	49	i. T.
14	3	55	i. *e*.
	7	2	i. O.
15	0	46	ii. *t*.
	2	8	i. *t*.
	3	15	ii. T.
	4	16	i. T.
	22	24	i. *e*.
16	1	29	i. O.
	*17	37	ii. *e*.
	18	16	iii. *t*.
	19	10	iii. T.
	20	35	i. *t*.
	21	54	ii. O.
	22	42	i. T.
17	*16	53	i. *e*.
	19	55	i. O.
18	*13	56	ii. *t*.
	*15	1	i. *t*.
	*16	25	ii. T.
	*17	9	i. T.
19	*11	21	i. *e*.
	*14	22	i. O.
20	4	2	iii. *e*.
	5	57	iii. E.
	6	55	ii. *e*.

Sept. (con.).

d	h	m	
20	*7	50	iii. *o*.
	*8	47	iii. O.
	*9	28	i. *t*.
	*11	3	ii. O.
	*11	35	i. T.
21	5	50	i. *e*.
	*8	48	i. O.
22	3	7	ii. *t*.
	3	54	i. *t*.
	5	35	ii. T.
	6	1	i. T.
23	0	19	i. *e*.
	3	15	i. O.
	20	12	ii. *e*.
	21	41	iii *t*.
	22	20	i. *t*.
	22	33	iii. T.
24	0	11	ii. O.
	0	27	i. T.
	18	47	i. *e*.
	21	41	i. O.
25	*16	16	ii. *t*.
	*16	46	i. *t*.
	18	44	ii. T.
	18	54	i. T.
26	*13	16	i. *e*.
	*16	7	i. O.
27	*8	4	iii. *e*.
	*9	29	ii. *e*.
	*9	57	iii. E.
	*11	12	i. *t*.
	*11	14	iii. *o*.
	*12	10	iii. O.
	*13	19	ii. O.
	*13	20	i. T.
28	*7	45	i. *e*.
	*10	34	i. O.
29	5	25	ii. *t*.
	5	38	i. *t*.
	7	46	i. T.
	7	54	ii. T.
30	2	13	i. *e*.
	5	0	i. O.
	22	47	i. *e*.

October.

d	h	m	
1	0	4	i. *t*.
	1	2	iii. *t*.
	1	55	iii. T.
	2	12	i. T.
	2	27	ii. O.
	20	42	i. *e*.
	23	26	i. O.
2	18	30	i. *t*.
	18	33	ii. *t*.
	20	38	i. T.
	21	2	ii. T.
3	*15	11	i. *e*.
	*17	52	i. O
4	*12	4	ii. *e*.

Oct. (con.).

d	h	m	
4	*12	5	iii. *e*.
	*12	56	i. *t*.
	*13	58	iii. E.
	*14	33	iii. *o*.
	*15	4	i. T.
	*15	30	iii. O.
	*15	34	ii. O.
5	*9	39	i. *e*.
	*12	18	i. O.
6	*7	22	i. *t*.
	*7	42	ii. *t*.
	*9	30	i. T.
	*10	11	ii. T.
7	4	8	i. *e*.
	*6	44	i. O.
8	1	22	ii. *e*.
	1	48	i. *t*.
	3	56	i. T.
	4	19	iii. *t*.
	4	41	ii. O.
	5	14	iii. T.
	22	37	i. *e*.
9	1	10	i. O.
	20	14	i. *t*.
	20	49	ii. *t*.
	22	22	i. T.
	23	18	ii. T.
10	17	6	i. *e*.
	19	36	i. O.
11	*14	39	ii. *e*.
	*14	40	i. *t*.
	*16	7	iii. *e*.
	*16	48	i. T.
	*17	48	ii. O.
	18	49	iii. O.
12	*11	34	i. *e*.
	14	2	i. O.
13	*9	6	i. *t*.
	*9	57	ii. *t*.
	*11	14	i. T.
	*12	27	ii. T.
14	*6	3	i. *e*.
	*8	28	i. O.
15	3	31	i. *t*.
	3	57	ii. *e*.
	*5	39	i. T.
	*6	54	ii. O.
	*7	33	iii. *t*.
	*8	32	iii. T.
16	0	32	i. *e*.
	2	54	i. O.
	21	57	i. *t*.
	23	4	ii. *t*.
17	0	5	i. T.
	1	34	ii. T.
	19	1	i. *e*.
	21	20	i. O.
18	*16	23	i. *t*.
	*17	14	ii. *e*.
	*18	31	i. T.
	20	1	ii. O.

Oct. (con.).

d	h	m	
18	20	9	iii. *e*.
	22	7	iii. O.
19	*13	29	i. *e*.
	*15	46	i. O.
20	*10	49	i. *t*.
	12	12	ii. *t*.
	*12	57	i. T.
	*14	42	ii. T.
21	*7	58	i. *e*.
	*10	12	i. O.
22	*5	15	i. *t*.
	*6	32	ii. *e*.
	*7	23	i. T.
	*9	7	ii. O.
	*10	45	iii. *t*.
	*11	49	iii. T.
23	2	27	i. *e*.
	4	38	i. O.
	23	40	i. *t*.
24	1	19	ii. *t*.
	1	49	i. T.
	3	49	ii. T.
	20	54	i. *o*.
	23	7	i. E.
25	*18	6	i. *t*.
	19	45	ii. *o*.
	20	14	i. T.
	22	23	ii. E.
26	0	12	iii. *e*.
	2	1	iii. E.
	*15	20	i. *o*.
	*17	36	i. E.
27	*12	32	i. *t*.
	*14	27	ii. *t*.
	*14	40	i. T.
	*16	57	ii. T.
28	*9	46	i. *o*.
	*12	4	i. E.
29	6	58	i. *t*.
	8	51	ii. *o*.
	*9	6	i. T.
	*11	41	ii. E.
	*13	56	iii. *t*.
	*15	6	iii. T.
30	4	12	i. *o*.
	*6	33	i. E.
31	1	24	i. *t*.
	3	32	i. T.
	3	34	ii. *t*.
	*6	4	ii. T.
	22	38	i. *o*.

November.

d	h	m	
1	1	2	i. E.
	19	50	i. *t*.
	21	58	ii. *o*.
	21	58	i. T.
2	0	59	ii. E.
	3	28	iii. *o*.
	*6	2	iii. E.
	*17	4	i. *o*.
	19	31	i. E.
3	*14	15	i. *t*.
	*16	24	i. T.
	*16	42	ii. *t*.
	19	13	ii. T.
4	*11	30	i. *o*.
	*14	0	i. E.
5	*8	41	i. *t*.
	*10	50	i. T.
	*11	4	ii. *o*.
	*14	17	ii. E.
	*17	9	iii. *t*.
	18	25	iii. T.
6	*5	56	i. *o*.
	*8	28	i. E.
7	3	7	i. *t*.
	*5	16	i. T.
	*5	49	ii. *t*.
	*8	21	ii. T.
8	0	22	i. *o*.
	2	57	i. E.
	21	33	i. *t*.
	23	42	i. T.
9	0	11	ii. *o*.
	3	34	ii. E.
	*6	42	iii. *o*.
	*8	4	iii. O.
	*8	15	iii. *e*.
	*10	3	iii. E.
	18	49	i. *o*.
	21	26	i. E.
10	*15	59	i. *t*.
	18	8	i. T.
	18	58	ii. *t*.
	21	30	ii. T.
11	13	15	i. *o*.
	*15	55	i. E.
12	*10	26	i. *t*.
	*12	34	i. T.
	*13	18	ii. *o*.
	*16	52	ii. E.
	20	24	iii. *t*.
	21	46	iii. T.
13	*7	41	i. *o*.

Nov. (con.).

d	h	m	
13	*10	24	i. E.
14	*4	52	i. *t*.
	*7	0	i. T.
	*8	6	ii. *t*.
	*10	38	ii. T.
15	2	7	i. *o*.
	*4	53	i. E.
	23	18	i. *t*.
16	1	27	i. T.
	2	26	ii. *o*.
	*6	10	ii. E.
	*9	58	iii. *o*.
	*11	26	iii. O.
	*12	17	iii. *e*.
	*14	4	iii. E.
	20	34	i. *o*.
	23	22	i. E.
17	17	44	i. *t*.
	19	53	i. T.
	21	15	ii. *t*.
	23	48	ii. T.
18	*15	0	i. *o*.
	17	50	i. E.
19	*12	11	i. *t*.
	*14	19	i. T.
	*15	34	ii. *o*.
	19	28	ii. E.
	23	43	iii. *t*.
20	1	11	iii. T.
	9	26	i. *o*.
	*12	19	i. E.
21	*6	37	i. *t*.
	*8	46	i. T.
	*10	24	ii. *t*
	*12	57	ii. T.
22	3	53	i. *o*.
	*6	48	i. E.
23	1	4	i. *t*.
	3	12	i. T.
	*4	43	ii. *o*.
	*8	46	ii. E.
	*13	18	iii. *o*.
	*14	52	iii. O
	*16	19	iii. *e*.
	18	5	iii. E.
	22	20	i. *o*.
24	1	17	i. E.
	19	30	i. *t*.
	21	39	i. T.
	23	35	ii. *t*.
25	2	8	ii. T.
	16	46	i. *o*.

Nov. (con.).

d	h	m	
25	19	46	i. E.
26	*13	57	i. *t*.
	*16	6	i. T.
	17	52	ii. *o*.
	22	4	ii. E.
27	3	5	iii. *t*.
	*4	39	iii. T.
	*11	13	i. *o*.
	*14	15	i. E.
28	*8	23	i. *t*.
	*10	32	i. T.
	*12	45	ii. *t*.
	*15	18	ii. T.
29	*5	40	i. *o*.
	*8	44	i. E.
30	2	50	i. *t*.
	*4	59	i. T.
	*7	1	ii. *o*.
	*11	22	ii. E.
	16	44	iii. *o*.
	18	23	iii. O.
	20	22	iii. *e*.
	22	7	iii. E.

December.

d	h	m	
1	0	7	i. *o*.
	3	13	i. E.
	21	17	i. *t*.
	23	26	i. T.
2	1	56	ii. *t*.
	*4	30	ii. T.
	18	34	i. *o*.
	21	42	i. E.
3	15	44	i. *t*.
	17	53	i. T.
	20	12	ii. *o*.
4	0	40	ii. E.
	*6	31	iii. *t*.
	*8	11	iii. T.
	*13	1	i. *o*.
	*16	11	i. E.
5	*10	11	i. *t*.
	*12	20	i. T.
	*15	8	ii. *t*.
	17	41	ii. T.
6	*7	28	i. *o*.
	*10	39	i. E.
7	*4	38	i. *t*.
	*6	47	i. T.
	*9	23	ii. *o*.

Dec. (con.).

d	h	m	
7	*13	58	ii. E.
	20	14	iii. *o*.
	21	59	iii. O.
8	0	24	iii. *e*.
	1	55	i. *o*.
	2	9	iii. E.
	*5	8	i. E.
	23	5	i. *t*.
9	1	14	i. T.
	*4	20	ii. *t*.
	*6	54	ii. T.
	20	22	i. *o*.
	23	37	i. E.
10	17	33	i. *t*.
	19	42	i. T.
	22	34	ii. *o*.
11	3	16	ii. E.
	*10	3	iii. *t*.
	*11	48	iii. T.
	*14	50	i. *o*.
	18	6	i. E.
12	*12	0	i. *t*.
	*14	9	i. T.
	17	33	ii. *t*.
	20	7	ii. T.
13	*9	17	i. *o*.
	*12	35	i. E.
14	*6	27	i. *t*.
	*8	36	i. T.
	*11	46	ii. *o*.
	16	35	ii. E.
	23	48	iii. *o*.
15	1	38	iii. O.
	3	45	i. *o*.
	*4	27	iii. *e*.
	*6	11	iii. E.
	*7	4	i. E.
16	0	55	i. *t*.
	3	4	i. T.
	*6	47	ii. *t*.
	*9	21	ii. T.
	22	12	i. *o*.
17	1	33	i. E.
	19	22	i. *t*.
	21	31	i. T.
18	0	59	ii. *o*.
	*5	53	ii. E.
	*13	40	iii. *t*.
	15	29	iii. T.
	16	40	i. *o*.
	20	2	i. E.
19	*13	50	i. *t*.

Dec. (con.).

d	h	m	
19	15	59	i. T.
	20	0	ii. *t*.
	22	35	ii. T.
20	*11	8	i. *o*.
	14	31	i. E.
21	8	18	i. *t*.
	*10	27	i. T.
	*14	12	ii. *o*.
	19	11	ii. E.
22	3	28	iii. *o*.
	*5	22	iii. O.
	*5	35	i. *o*.
	*8	29	iii. *e*.
	*9	0	i. E.
	*10	13	iii. E.
23	2	46	i. *t*.
	*4	55	i. T.
	*9	15	ii. *t*.
	*11	50	ii. T.
24	0	3	i. *o*.
	3	29	i. E.
	21	13	i. *t*.
	23	23	i. T.
25	3	27	ii. *o*.
	*8	30	ii. E.
	17	23	iii. *t*.
	18	31	i. *o*.
	19	15	iii. T.
	21	8	i. E.
26	15	41	i. *t*.
	17	51	i. T.
	22	30	ii. *t*.
27	1	5	ii. T.
	*13	0	i. *o*.
	16	27	i. E.
28	*10	9	i. *t*.
	*12	19	i. T.
	16	41	ii. *o*.
	21	48	ii. E.
29	*7	13	iii. *o*.
	*7	28	i. *o*.
	*9	10	iii. O.
	*10	56	i. E.
	*12	31	iii. *e*.
	14	14	iii. E.
30	*4	38	i. *t*.
	*6	47	i. T.
	*11	47	ii. *t*.
	14	22	ii. T.
31	1	56	i. *o*.
	*5	25	i. E.
	23	6	i. *t*.

Satellites I. and II. reappear at eclipse on the *f* side in January and February and in November and December. They disappear on the *p* side from May to October. Satellite II. reappears on the *p* side in July and August. Satellite III. disappears and reappears on the *f* side in January and February. Satellite IV. disappears and reappears on the *f* side in January. Satellite III. disappears and reappears on the *p* side from May to September. It disappears on the *p* side in October and disappears and reappears on the *f* side in November and December. There are no eclipses of Satellite IV. from February to end of the year.

CONFIGURATIONS OF JUPITER'S SATELLITES

FOR AN INVERTING TELESCOPE.

Day.	Jan. 7h	Feb. 6½h	May. 15½h	June. 14½h	July. 13½h	Aug. 13h	Sept. 12¼h	Oct. 11½h	Nov. 10h	Dec. 9h	Day.
1	41○3●	432○1	○1243	4231○	431○2	●4○31	21○34	13○24	32○14	4○132	1
2	4○312	431○●	1○234	34○12	432○1	41○23	32○14	3○214	1○324	412○3	2
3	●324○	43○2♃	♃23○4	3○42●	●421○	42○13	31○42	321○4	○1234	24○13	3
4	321○4	42○13	32○14	231○4	4○23♃	●42○3	342○♃	23○14	21○34	13○42	4
5	3○124	421○3	31○24	2○134	4○123	431○2	423○1	○234●	♃○234	3○124	5
6	1○234	●○123	32○14	1○234	241○3	43○12	41○23	12○43	3○124	32○4●	6
7	2○134	1○24♃	21○34	♃○134	32○41	4321○	4○213	24○13	312○4	312○4	7
8	●1○34	32○14	○4123	213○4	31○24	42○31	421○3	413○2	32○41	○1324	8
9	○3124	312○4	41○23	3○124	3○14♃	14○23	42○31	43○12	14○32	12○34	9
10	321○4	3○124	42○31	●3○24	213○4	○143♃	431○2	4321○	4○123	2○134	10
11	♃32○4	2○34●	432○1	♃23○4	○1234	●2○34	34○1♃	423○1	421○3	1○324	11
12	34○12	21○34	431○2	42○13	○234●	♃3○24	23○4●	41○23	42○13	34○12	12
13	41○32	○1234	43○1♃	41○23	21○34	3○124	1○234	♃41○3	43○2●	3421○	13
14	42○13	1○342	421○3	4○213	23○14	321○4	○1234	24○13	♃431○	4321○	14
15	412○3	324○1	4○213	421○♃	314○2	23○14	21○34	13○42	432○1	4○132	15
16	4○132	3412○	41○23	43○21	34○21	1○234	2○314	3○124	●41○2	♃41○3	16
17	♃431○	43○12	2○413	431○2	4213○	○2413	31○24	321○4	○4123	42○13	17
18	432○1	♃4○13	●32○4	432○♃	4○213	241○3	3○214	32○14	21○43	41○32	18
19	34○2●	421○3	31○24	24○13	●4○23	43○12	●32○4	1○324	2○134	43○12	19
20	●14○2	4○123	3○214	1○423	421○3	43○12	41○23	○234♃	●3○24	3214○	20
21	2○143	41○32	21○34	○2134	423○1	4321○	4○123	2○134	31○24	32○4♃	21
22	12○34	432○1	○2134	21○34	341○2	●42○1	421○3	♃1○24	32○14	○1324	22
23	○1324	312○4	1○234	3○14●	34○21	41○23	42○31	34○12	13○24	1○234	23
24	31○24	3○124	2○134	31○24	231○4	4○213	431○2	3421○	○1234	2○134	24
25	32○14	1○24●	321○4	32○14	●○134	241○3	43○21	432○1	21○43	1○234	25
26	●3○24	2○34♃	♃34○2	●2○34	1○234	●3○14	4321○	41○32	42○13	3○124	26
27	31○24	○1234	43○12	1○243	2○34♃	●3○24	♃4○3●	4○123	431○2	321○4	27
28	2○143	1○324	4213○	○4123	2○314	321○4	4○123	42○3●	♃43○2	32○14	28
29	124○3	23○14	●4○13	421○3	31○24	23○14	12○43	41○3●	432○1	4○2●●	29
30	4○123		41○23	●43○1	3○214	1○234	2○314	43○12	413○●	41○23	30
31	413○2		42○13		231○4	○2134		3124○		42○13	31

The circle (○) represents Jupiter; ♃ signifies that the satellite is on the disk; ● signifies that the satellite is behind the disk or in the shadow.

THE FIRST MAGNITUDE STARS.

Star.	Mag.	Spectrum.	R.A. 1916·0.	Dec. 1916·0.	Star.	Mag.	Spectrum.	R.A. 1916·0.	Dec. 1916·0.
			h m s	° ′ ″				h m s	° ′ ″
Achernar ...	0·6	B5	1 34 35·22	−57 39 48·0	*β* Crucis ...	1·5	B1	12 42 48·16	−59 13 47·4
Aldebaran ..	1·1	K5	4 31 5·92	+16 20 28·9	Spica	1·2	B2	13 20 45·93	−10 43 23·4
Capella	0·2	G	5 10 28·88	+45 54 49·8	*β* Centauri...	0·9	B1	13 57 53·03	−59 58 6·0
Rigel	0·3	B8	5 10 30·01	− 8 17 52·1	Arcturus ...	0·2	K	14 11 49·77	+19 37 9·2
Betelgeuse ...	var.	Ma	5 50 37·44	+ 7 23 32·5	*α*² Centauri ..	0·3	G	14 33 53·65	−60 29 15·5
Canopus......	−0·9	F	6 22 5·23	−52 38 58·1	Antares	1·2	Ma	16 24 15·25	−26 14 47·6
Sirius	−1·6	A	6 41 26·65	−16 36 1·0	Vega	0·1	A	18 34 5·66	+38 42 17·4
Procyon	0·5	F5	7 34 54·27	+ 5 26 27·4	Altair.........	0·9	A5	19 46 41·10	+ 8 38 44·2
Pollux	1·2	K	7 40 10·69	+28 13 48·2	Deneb	1·3	A2	20 38 34·07	+44 58 46·5
Regulus	1·3	B8	10 3 54·02	+12 22 41·5	Fomalhaut...	1·3	A3	22 53 0·73	−30 4 4·0
*α*¹ Crucis ...	1·6	B1	12 21 54·87	− 62 38 1·4					

SATELLITES OF SATURN, 1916.

East Elongations.

Mimas.

(*Every Fifth Eastern Elongation is given.*)

Jan.		Feb.		March.		April.		May.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
0	5·0	2	4·4	1	10·9	3	10 7	1	17·4	17	7·3	1	10·6	3	10·2	1	16·8
4	22·0	6	21·5	6	4·0	8	3·8			22	0·4	6	3·7	8	3·3	6	9·8
9	15·1	11	14·5	10	21·1	12	21·0			26	17·5	10	20·9	12	20·4	11	2·9
14	8·2	16	7·5	15	14·2	17	14·2					15	14·0	17	13·5	15	20·0
19	1·2	21	0·7	20	7·3	22	7·2					20	7·0	22	6·6	20	13·0
23	18·3	25	17·8	25	0·4	27	0·3					25	0·1	26	23·7	25	6·1
28	11·3			29	17·5							29	17·2			29	23·1

Enceladus.

(*Every Fifth Eastern Elongation is given.*)

Jan.		Feb.		March.		April.		May.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
1	1·4	4	7·2	2	16·9	5	23·1	3	9·1	17	11·1	1	4·1	4	10·3	1	20·1
7	21·7	11	3·6	9	13·3	2	19·6			24	7·6	8	0·7	11	6·7	8	16·4
14	18·1	18	0·0	16	9·7	9	16·1					14	21·1	18	3·1	15	12·8
21	14·4	24	20·4	23	6·2	26	12·6					21	17·4	24	23·6	22	9·0
28	10·8			30	2·7							28	13·9			29	5·4

Tethys.

Jan.		Feb.		March.		April.		May.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
2	17·8	1	22·4	1	6·0	2	8·3	2	13·5	17	11·1	2	13·7	1	18·7	1	23·6
4	15·1	3	19·7	3	3·3	4	5·7			19	8·4	4	11·0	3	16·0	3	20·9
6	12·4	5	17·0	5	0·6	6	3·0			21	5·7	6	8·3	5	13·3	5	18·2
8	9·7	7	14·3	6	21·9	8	0·3			23	3·1	8	5·6	7	10·6	7	15·5
10	7·0	9	11·6	8	19·2	9	21·6			25	0·4	10	3·0	9	8·0	9	12·8
12	4·2	11	9·0	10	16·5	11	19·0			26	21·7	12	0·3	11	5·3	11	10·1
14	1·5	13	6·3	12	13·8	13	16·3			28	19·1	13	21·6	13	2·6	13	7·3
15	22·8	15	3·6	14	11·2	15	13·6			30	16·4	15	18·9	14	23·9	15	4·6
17	20·1	17	0·9	16	8·5	17	10·9					17	16·2	16	21·2	17	1·9
19	17·4	18	22·2	18	5·8	19	8·3					19	13·5	18	18·5	18	23·2
21	14·7	20	19·5	20	3·1	21	5·6					21	10·8	20	15·8	20	20·5
23	12·0	22	16·8	22	0·4	23	2·9					23	8·1	22	13·1	22	17·8
25	9·3	24	14·1	23	21·7	25	0·2					25	5·5	24	10·4	24	15·1
27	6·5	26	11·4	25	19·0	26	21·5					27	2·8	26	7·7	26	12·4
29	3·8	28	8·7	27	16·4	28	18·9					29	0·1	28	5·0	28	9·6
31	1·1			29	13·7	30	16·2					30	21·4	30	2·3	30	6·9
				31	11·0												

East Elongations.

DIONE.

Jan.		Feb.		March.		April.		May.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
3	3·3	2	5·2	3	7·6	2	10·3	2	13·2	19	6·3	2	22·9	2	1·7	2	4·1
5	20·9	4	22·9	6	1·3	5	4·0			22	0·0	5	16·6	4	19·4	4	21·8
8	14·5	7	16·6	8	19·0	7	21·7			24	17·8	8	10·3	7	13·1	7	15·4
11	8·1	10	10·2	11	12·7	10	15·4			27	11·5	11	4·1	10	6·7	10	9·1
14	1·8	13	3·9	14	6·3	13	9·1			30	5·2	13	21·8	13	0·4	13	2·7
16	19·4	15	21·5	17	0·0	16	2·8					16	15·5	15	18·1	15	20·4
19	13·0	18	15·2	19	17·7	18	20·6					19	9·2	18	11·8	18	14·0
22	6·6	21	8·9	22	11·4	21	14·3					22	2·9	21	5·5	21	7·7
25	0·3	24	2·6	25	5·1	24	8·0					24	20·6	23	23·1	24	1·3
27	17·9	26	20·2	27	22·8	27	1·7					27	14·3	26	16·8	26	19·0
30	11·6	29	13·9	30	16·5	29	19·5					30	8·1	29	10·5	29	12·6

RHEA.

Jan.		Feb.		March.		April.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
3	21·1	4	11·2	2	13·5	3	4·7	17	13·8	1	3·5	1	18·6	3	9·6
8	9·4	8	23·6	7	1·9	7	17·1	22	2·4	5	16·0	6	7·1	7	21·9
12	21·7	13	11·9	11	14·3	12	5·6	26	14·9	10	4·4	10	19·5	12	10·3
17	10·0	18	0·3	16	2·7	16	18·1			14	16·9	15	8·0	16	22·6
21	22·3	22	12·7	20	15·1	21	6·6			19	5·4	19	20·5	21	11·0
26	10·6	27	1·1	25	3·5	25	19·1			23	17·8	24	8·9	25	23·3
30	22·9			29	16·1	30	7·7			28	6·2	28	21·2	30	11·6

TITAN.

Jan.		Feb.		March.		April.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
5	18·9	6	13·7	9	10·0	10	8·5	17	15·0	3	15·0	4	13·8	6	10·6
21	16·2	22	11·7	25	8·9	26	8·4			19	14·7	20	12·5	22	8·3

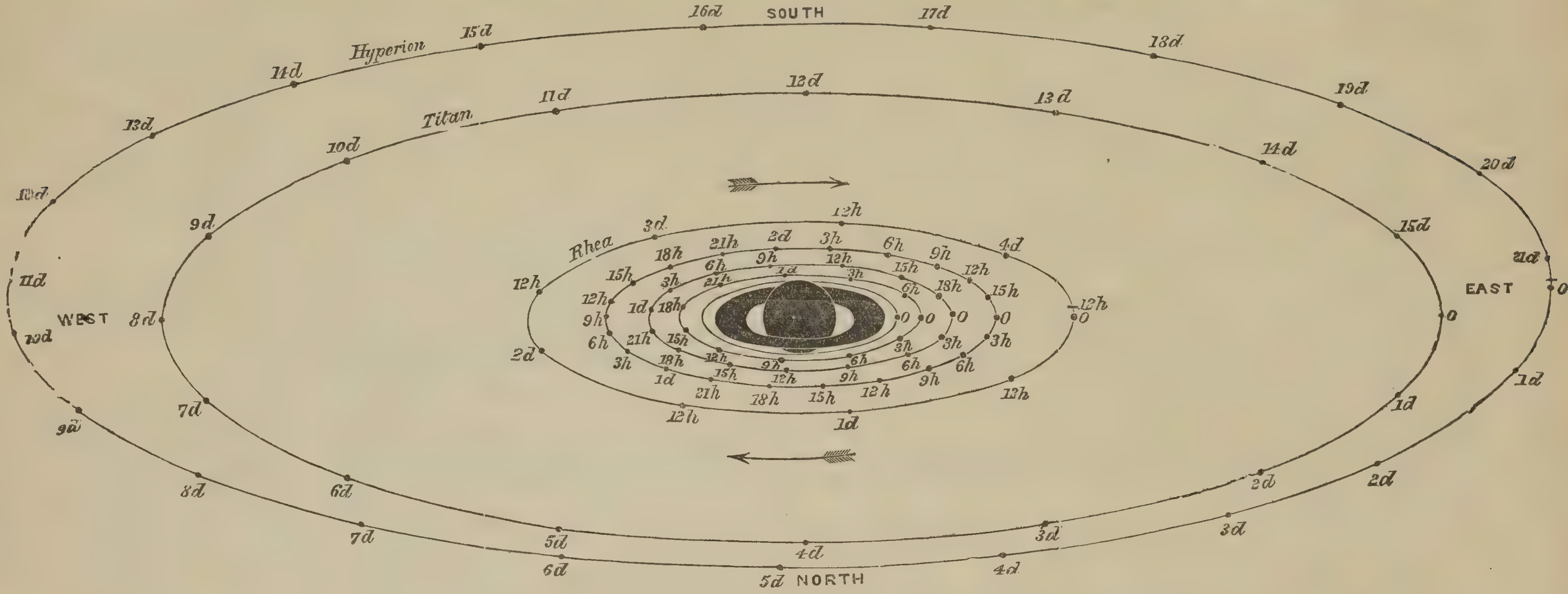
HYPERION.

Jan.		Feb.		March.		April.		Sept.		Oct.		Nov.		Dec.	
d	h	d	h	d	h	d	h	d	h	d	h	d	h	d	h
8	10·0	19	23·9	12	8·6	2	18·7	21	12·3	12	20·4	3	2·6	15	10·3
29	16·5					24	5·6					24	7·3		

IAPETUS.

	d	d	d	d
E. Elongation	Feb. 23·9;	Oct. 23·6		
Inf. Conjunction	Mar. 15·3;	Nov. 12·7		
W. Elongation.........	Jan. 15·4;	Apr. 3·3;	Dec. 1·5	
Sup. Conjunction ...	Feb. 3·4;	Apr. 22·9;	Oct. 2·5;	Dec. 20·9

APPARENT ORBITS OF THE SEVEN INNER SATELLITES OF SATURN, as seen in an Inverting Telescope.



The arrows in the diagram show the direction of the motion of the Satellites. The figures indicate the interval from the time of last East Elongation.

Apparent Elements of Saturn's Ring.

Greenwich Mean Noon.	Position-angle of Minor Axis.	Outer Ring.		Latitude above Plane of Ring.	
		Maj. Axis.	Min. Axis.	Earth.	Sun.
	° ′	″	″	° ′	° ′
Jan. 3	−6 57·8	46·67	−19·60	24 50·5 S.	24 54·7 S.
11	6 56·1	46·62	19·70	24 59·9 S.	24 51·6 S.
19	6 54·3	46·46	19·75	25 8·8 S.	24 48·4 S.
27	6 52·7	46·18	19·73	25 17·1 S.	24 45·1 S.
Feb. 4	6 51·1	45·81	19·66	25 24·4 S.	24 41·8 S.
12	6 49·9	45·35	19·53	25 30·5 S.	24 38·5 S.
20	6 49·0	44·82	19·36	25 35·7 S.	24 35·1 S.
28	6 48·3	44·24	19·15	25 39·4 S.	24 31·7 S.
Mar. 7	6 48·1	43·63	18·92	25 41·8 S.	24 28·3 S.
15	6 48·1	43·01	18·66	25 42·7 S.	24 24·8 S.
23	6 48·5	42·37	18·38	25 42·4 S.	24 21·2 S.
31	6 49·3	41·75	18·09	25 40·6 S.	24 17·6 S.
Apr. 8	6 50 5	41·14	17·79	25 37·5 S.	24 14·0 S.
16	6 51·9	40·56	17·50	25 33·0 S.	24 10·4 S.
24	6 53·5	40·01	17·20	25 27·2 S.	24 6·7 S.
May 2	6 55·4	39·51	16·91	25 20·1 S.	24 3·0 S.
10	6 57·4	39·05	16·63	25 11·9 S.	23 59·3 S.
18	6 59·6	38·65	16·36	25 2·3 S.	23 55·5 S.
26	7 1·9	38·30	16·10	24 51·5 S.	23 51·7 S.
June 3	7 4·0	38·00	15·85	24 39·7 S.	23 47·8 S.
11	7 6·0	37·75	15·62	24 26·8 S.	23 43·9 S.
19	7 8·0	37·57	15·40	24 13·0 S.	23 40·0 S.
27	7 9·7	37·43	15·20	23 58·2 S.	23 36·0 S.
July 5	7 11·3	37·35	15·02	23 42·8 S.	23 32·0 S.
13	7 12·8	37·32	14·85	23 26·8 S.	23 27·9 S.
21	7 14·2	37 36	14·70	23 10·3 S.	23 23·8 S.
29	7 15·4	37·45	14·56	22 53·6 S.	23 19·7 S.
Aug. 6	7 16·2	37·60	14·46	22 36·8 S.	23 15·5 S.
14	7 16·9	37·80	14·37	22 20·2 S.	23 11 3 S.
22	7 17·4	38·06	14·30	22 3·8 S.	23 7·0 S.
30	7 17·8	38·38	14·25	21 47·8 S.	23 2·7 S.
Sept. 7	7 18·0	38·74	14·23	21 32·7 S.	22 58·4 S.
15	7 18·1	39·15	14·24	21 18·7 S.	22 54·0 S.
23	7 18·2	39·63	14·27	21 5·7 S.	22 49·6 S.
Oct. 1	7 18·2	40·13	14·33	20 54·4 S.	22 45·1 S.
9	7 18·1	40·68	14·42	20 44·9 S.	22 40·7 S.
17	7 18·0	41·27	14·54	20 37·1 S.	22 36·1 S.
25	7 17·9	41·88	14·69	20 31·8 S.	22 31·6 S.
Nov. 2	7 17·9	42·50	14·87	20 28·6 S.	22 27·0 S.
10	7 17·9	43·13	15·08	20 27·9 S.	22 22·4 S.
18	7 18·0	43·75	15·31	20 29·5 S.	22 17·8 S.
26	7 18·0	44·34	15·58	20 33·7 S.	22 13·1 S.
Dec. 4	7 18·2	44·89	15·85	20 40·1 S.	22 8·4 S.
12	7 18·3	45·37	16·12	20 48·5 S.	22 3·7 S.
20	7 18·4	45·79	16·40	20 59·0 S.	21 58·9 S.
28	−7 18·5	46·11	−16·66	21 10·8 S.	21 54·1 S.

Magnetic Elements, Royal Observatory, Greenwich.

Date.	Declination West.	Horizontal force. C.G.S. units.	Dip.
	° ′		° ′
1909	15 47·6	0·1853	66 52·8
1912	24·3	0·1853	66 51·8
1914	6·3	0·1853	66 51·2
1915	14 57·0	0·1851	66 52·0
1916 (inferred)............	48·0	0·1849	66 53·0

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE SUN.

Greenwich Mean Noon.				Greenwich Mean Noon.			
1916.	P.	D.	L.	1916.	P.	D.	L.
	° ′	° ′	° ′		° ′	° ′	° ′
Jan. 1	+ 2 22	−3 5	313 30	July 4	− 1 13	+3 21	31 45
6	− 0 4	3 39	247 39	9	+ 1 3	3 52	325 35
11	2 29	4 11	181 49	14	3 19	4 22	259 25
16	4 52	4 42	115 58	19	5 31	4 50	193 15
21	7 11	5 10	50 8	24	7 41	5 16	127 6
26	9 26	5 36	344 18	29	9 46	5 40	60 58
31	11 34	5 59	278 28	Aug. 3	11 46	6 1	354 50
Feb. 5	13 36	6 19	212 38	8	13 41	6 20	288 43
10	15 31	6 37	146 48	13	15 29	6 37	222 37
15	17 17	6 51	80 58	18	17 11	6 50	156 32
20	18 55	7 2	15 7	23	18 45	7 1	90 28
25	20 25	7 10	309 16	28	20 12	7 8	24 24
Mar. 1	21 44	7 14	243 25	Sept. 2	21 31	7 13	318 21
6	22 55	7 15	177 32	7	22 41	7 15	252 19
11	23 56	7 13	111 39	12	23 42	7 13	186 18
16	24 47	7 7	45 45	17	24 34	7 9	120 17
21	25 27	6 58	339 50	22	25 17	7 1	54 17
26	25 57	6 46	273 53	27	25 49	6 50	348 18
31	26 17	6 31	207 56	Oct. 2	26 12	6 36	282 19
Apr. 5	26 25	6 13	141 58	7	26 24	6 19	216 22
10	26 23	5 53	75 59	12	26 25	5 59	150 23
15	26 10	5 30	9 58	17	26 15	5 37	84 26
20	25 46	5 5	303 56	22	25 53	5 12	18 30
25	25 10	4 37	237 52	27	25 20	4 44	312 34
30	24 24	4 8	171 48	Nov. 1	24 35	4 14	246 38
May 5	23 26	3 37	105 43	6	23 38	3 43	180 42
10	22 19	3 4	39 36	11	22 29	3 9	114 47
15	21 1	2 31	333 28	16	21 9	2 34	48 52
20	19 32	1 56	267 20	21	19 37	1 58	342 58
25	17 55	1 20	201 11	26	17 55	1 20	277 4
30	16 10	0 44	135 1	Dec. 1	16 4	0 43	211 10
June 4	14 16	−0 8	68 50	6	14 2	+0 4	145 17
9	12 16	+0 28	2 40	11	11 54	−0 34	79 23
14	10 10	1 4	296 29	16	9 39	1 13	13 31
19	8 0	1 40	230 18	21	7 19	1 50	307 39
24	5 46	2 14	164 7	26	4 55	2 27	241 47
29	− 3 30	+2 48	07 56	31	+ 2 29	−3 3	175 56

The position-angle of the Sun's axis, P, is the position-angle of the N. end of the axis from the N. point of the Sun, read in the direction N., E., S., W. In computing D (the heliographic latitude of the centre of the Sun's disc), the inclination of the Sun's axis to the ecliptic has been assumed to be 82° 45′, and the longitude of the ascending node for 1916·0 to be 74° 35′·3. In computing L (the heliographic longitude of the centre of the Sun's disc), the Sun's period of rotation has been assumed to be 25·38 days, and the meridian which passed through the ascending node at the epoch 1854 Jan. 1, Mean Noon, has been taken as the zero meridian.

Chief Radiant-point and Average Number of Visible Shooting Stars for every Night in the Year. By W. F. DENNING.

Day of Month.	January.			February.			March.			April.			May.			June.		
	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n
1	230	+52	10	131	+32	7	166	+5†	7	130	+30	8	331	−3	7	350	+38	8
2	230	+52*	18	211	+69	8	176	+9	7	140	+50	7	332	−3	7	330	+29	6
3	230	+52*	28	120	−7	7	167	+4	6	236	+9	8	333	−2†	6	252	−10	5
4	230	+52	12	61	+28	7	116	+47	7	121	−1	8	334	−2*	6	330	+27	6
5	230	+52	9	60	+35	6	51	+43	8	238	+5	7	336	−2†	7	285	+32	6
6	230	+52	10	130	+46	6	17	+6	7	280	+58	7	337	−2†	6	234	+38	7
7	132	+34	9	210	−28	6	270	+47	6	210	−10	8	338	−2	5	252	−23	6
8	329	+60	8	32	+9	7	104	+34	7	204	−9	6	339	−1	5	220	+39	6
9	230	+52	7	47	+46	7	100	±0	7	19	+57	7	207	−10	6	273	−3	6
10	43	+22	7	147	−12	7	240	+63	7	197	+71	7	234	−10	6	261	+5	7
11	220	+13	7	75	+41	6	213	+53	8	236	+8	8	284	+47	6	311	+62	6
12	154	−10	8	130	+21	6	238	+39	8	167	+31	8	234	+11	6	252	+12	6
13	230	+52	8	201	+57	7	133	+31	7	199	+9	7	237	−16	6	310	+61	7
14	129	+44	8	105	+51	7	270	+48	8	173	+45	7	313	+15	7	262	−12	6
15	120	−3	9	236	+11	7	250	+54	9	194	+30	8	294	+0	6	282	−13	6
16	119	+0	8	155	+40	8	134	+39	8	219	+78	7	296	+0	6	270	+47	7
17	295	+53	9	72	+43	8	264	+63	9	262	+62	6	330	+50	5	252	+11	7
18	111	+23	9	55	+82	8	316	+78	10	267	+33	6	231	+27	5	262	+62	8
19	191	+72	9	176	+47	8	161	+57	9	268	+33	7	252	−20	5	263	−12	7
20	213	+53	9	263	+36	9	203	+57	8	270	+33*	8	302	+20	6	333	+27	6
21	200	+9	10	181	+36	9	161	+57	8	271	+33*	9	252	+11	6	335	+57	8
22	143	+38	9	155	+14	9	105	+52	7	272	+33	10	283	−13	6	261	+3	8
23	159	+27	8	262	+63	8	190	+20	7	273	+33	8	331	+72	7	260	+36	6
24	143	+38	7	75	+42	8	161	+58	8	275	+33	7	246	+29†	7	238	+47	7
25	331	+56	6	117	+47	8	175	+20	8	272	+21	6	278	+31	6	24	+43†	7
26	261	+63	6	160	+59	8	208	−10	8	260	+62	6	194	+58	6	352	+39	7
27	220	+13	7	165	+5	7	229	+32	7	121	+28	5	273	+22	6	213	+53	7
28	122	+29	7	150	−11	7	263	+62	7	200	+7	6	252	−22	5	335	+58	7
29	213	+52†	8	47	+45	8	316	+76	8	190	+59	5	246	+29	6	305	+37	6
30	156	+42	7				220	+40	8	291	+59†	6	330	+28	6	303	+24	6
31	194	+57	8				260	+61	9				311	+80	7			

July.			August.			September.			October.			November.			December.			Day of Month.
Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. α °	δ °	n	Radiant. σ °	δ °	n	
270	+30	7	33	+55	21	240	+70	16	262	+63	15	43	+22†	14	44	+56	12	1
294	+39	8	34	+55	20	304	+51†	15	230	+52	13	58	+9†	12	47	+42	9	2
43	+36	7	35	+55	19	74	+41	14	133	+79	14	61	+35	12	162	+58	9	3
316	+46	8	36	+56	19	346	+1	13	310	+79	14	61	+34	13	110	+25	10	4
11	+48	9	38	+56	21	350	+42	12	98	+43	14	61	+35	14	105	+34	11	5
282	−13	9	39	+56	22	61	+36	12	316	+59	12	61	+35	12	80	+23	12	6
294	+39	8	40	+56	24	73	+4	14	31	+18	13	77	+31	13	117	+32	13	7
310	+78	8	42	+57	27	335	+28	13	77	+31†	12	58	+16	13	107	+33	12	8
304	−15	9	43	+57	34	73	+14	12	100	+13	14	105	+51	14	108	+33	14	9
284	−13	9	44	+57*	48	74	+41†	12	35	−10	13	59	+18	14	110	+33	16	10
319	+22	10	45	+57*	69	330	+71	13	13	+6	14	108	+11	15	111	+33*	22	11
7	+37	10	47	+57	48	5	+10	12	42	+55	14	43	+21	16	112	+33*	23	12
317	+31†	11	48	+57	30	13	+5	13	192	+83	15	150	+22	17	113	+32	19	13
314	+47	11	50	+58	22	30	+36	14	133	+68	16	150	+22*	20	114	+32	16	14
15	+49	12	51	+58	20	61	+35	15	31	+9†	17	150	+22*	21	52	+31	13	15
16	+49	12	52	+58	18	61	+36	15	92	+15	21	150	+22	18	192	+70	10	16
17	+50	13	54	+58	17	61	+36	15	92	+15	20	25	+43	17	133	+48	10	17
18	+50	13	55	+58	16	270	+48	14	92	+15	21	25	+43	16	134	+8	9	18
19	+51	14	56	+59	15	75	+15	13	92	+15*	21	25	+43	15	194	+67	8	19
20	+51	15	312	+10	15	5	+10	14	92	+15*	20	25	+43	14	145	+7	9	20
21	+51	16	291	+60	16	31	+19†	15	92	+15	19	63	+22†	15	117	+47†	8	21
22	+51	17	291	+60	17	74	+42	17	92	+15	18	63	+22*	16	194	+67	10	22
23	+52	18	291	+60	19	17	+31	16	100	+13	17	63	+22	15	194	+33	10	23
24	+52	19	60	+50	19	7	+44	15	92	+15	16	79	+21	16	218	+36	8	24
25	+53	20	5	+11	20	98	+42†	14	92	+15	16	155	+37	14	167	+32	8	25
26	+53	21	320	+11	21	87	+42	13	43	+12	15	161	+58	15	47	+65	9	26
27	+53	23	75	+33	20	4	+28†	14	45	+27	14	155	+36	14	177	+49	8	27
28	+54	25	292	+70	19	75	+15	15	44	+5†	15	63	+21	15	115	+32	9	28
29	+54	27	106	+52	20	348	+2	13	109	+23	16	44	+56	14	77	+32	9	29
30	+54	26	46	+43	19	13	+6†	14	26	+72	15	190	+58	13	230	+52	10	30
32	+54	23	2	−2	18				43	+22	14				230	+52	9	31

* Special showers. † Probable good displays.

LONG PERIOD VARIABLE STARS.

Dates of all Maxima reaching 7^{m}·5 *in* 1916.

Star.	R.A. 1915·0.	Dec. 1915·0.	Magnitude.		Dates of Maximum 1916.	Period in Days.
			Max.	Min.		
	h m s	° ′	m	m		
T Ceti	0 17 28	−20 32·2	5·4	6·9	Mar. 16, Aug. 25.	162
T Cassiopeiæ .	18 37	+55 19·1	6·7	12·5	Mar. 12.	443
R Androm. ...	19 33	+38 6·2	5·6	14·0	July 19.	411
S Ceti	19 44	− 9 48·1	7·3	13·6	Jan. 13.	321
RX Cephei ...	43 9	+81 30·3	7·4	7·9	Feb. 17, June 26, Nov. 3.	130
S. Cassiopeiæ .	1 13 22	+72 10·0	7·2	13·7	(1917, Sept. 3.)	610
R Piscium ...	26 15	+ 2 26·5	7·0	14·0	Nov. 4.	344
U Persei	53 57	+54 24·4	7·0	10·9	Jan. 8.	317
R Arietis	2 11 17	+24 39·6	7·3	13·2	April 6, Oct. 9.	187
W Androm. ...	12 11	+43 54·6	7·0	13·8	Mar. 11.	395
o Ceti	15 3	− 3 21·5	2·0	9·6	Jan. 8.	331
R Ceti	21 42	− 0 33·9	7·0	<12·9	Feb. 6, July 21.	167
U Ceti	29 39	−13 31·1	6·6	12·7	July 5.	235
R Trianguli ...	31 53	+33 53·4	5·3	12·0	Mar. 6, Nov. 26.	265
T Arietis	43 35	+17 9·1	7·4	9·7	Feb. 14.	313
U Arietis	3 6 20	+14 27·8	7·2	13·8	Mar. 9.	371
R Tauri	4 23 38	+ 9 58·5	7·4	13·8	July 3.	325
T Camelop. ...	31 48	+65 58·7	7·0	13·5	April 18.	370
X Camelop. ...	34 29	+74 57·8	7·3	13·1	April 5, Aug. 26.	142
R Leporis	55 44	−14 56·3	6·0	10·4	(1917, Jan. 2.)	436
R Aurigæ ...	5 10 25	+53 29·8	6·5	13·3	Aug. 7.	456
U Orionis	50 47	+20 9·9	5·8	12·1	Aug. 26.	374
η Gemin.	6 9 45	+22 32·0	3·3	4·2	*Min. Mar.* 13, *Nov.* 1.	232
R Lyncis	54 18	+55 27·4	6·5	14·0	April 20.	379
R Gemin. ...	7 2 14	+22 50·6	6·6	13·2	Oct. 2.	370
R Can. Min....	4 2	+10 9·5	7·2	10·0	June 12.	338
Z Puppis	28 58	−20 28·3	7·5	14·0	Nov. 26.	516
R Cancri	8 11 53	+11 59·3	6·5	11·0	Aug. 20.	362
V Cancri	16 53	+17 33·7	7·1	12·8	May 3.	272
S Hydræ	49 8	+ 3 23·6	7·5	<12·2	Jan. 20, Oct. 2.	256
T Hydræ	51 32	− 8 48·6	7·4	13·1	Sept. 3.	289
W Cancri	9 4 56	+25 35·7	7·4	14·0	Mar. 1.	385
R Leo. Min. ...	40 29	+34 54·4	7·1	12·9	Jan. 20.	371
R Leonis	42 59	+11 49·7	5·0	10·2	July 14.	313
R Ursæ Maj. .	10 38 42	+69 13·5	5·9	13·1	Oct. 21.	299
R Comæ	11 59 54	+19 15·6	7·3	14·6	May 28.	362
R Corvi.........	12 15 13	−18 46·7	5·9	12·5	May 9.	318
RY Ursæ Maj.	16 23	+61 45·1	7·2	8·3	*Min. June* 30.	315
T Ursæ Maj. .	32 33	+59 57·4	5·5	12·7	June 28,	257
R Virginis ...	34 12	+ 7 27·4	6·2	11·1	Feb. 22, July 16, Dec. 8.	145
S Ursæ Maj. .	40 15	+61 33·5	7·0	<12	Mar. 8, Oct. 21.	226
R Hydræ ...	13 25 4	−22 50·4	3·5	10·1	July 26.	425
S Virginis	28 34	− 6 45·4	6·2	12·5	Jan. 12.	377
V Ursæ Min. .	37 10	+74 44·8	7·5	8·7	Feb. 26, May 7, July 17, Sept. 26, Dec. 6.	71
R Can. Venat..	45 18	+39 57·9	7·4	12·2	Feb. 15.	328
RS Virginis ...	14 23 1	+ 5 3·7	7·0	13·8	Aug. 19.	355
R Camelop. ...	23 35	+84 13·0	7·2	13·3	Apr. 5, Dec. 31.	270
V Boötis	26 19	+39 14·3	6·4	11·3	June 22.	259
R Boötis	33 27	+27 6·5	5·9	12·2	July 10.	223
S Coronæ Bor.	15 17 55	+31 40·3	6·1	13·4	Feb. 8.	362
RS Libræ	19 22	−22 36·6	7·1	13·0	May 9, Dec. 12.	217
S Ursæ Min....	32 47	+78 55·2	7·2	11·6	May 8.	323
V Coronæ Bor.	46 29	+39 49·3	7·2	12·4	Feb. 16.	358
R Serpentis ...	46 47	+15 23·2	5·8	<13·0	April 25.	357
RU Herculis...	16 6 41	+25 17·5	7·0	14·2	Sept. 10.	483

Long Period Variable Stars (*continued*).

Star.	R.A. 1915·0.	Dec. 1915·0.	Magnitude. Max.	Magnitude. Min.	Dates of Maximum 1916.	Period in Days.
	h m s	° ′	m	m		
V Ophiuchi ...	16 22 0	−12 13·9	6·9	10·8	Aug. 12.	302
U Herculis ...	22 2	+19 5·2	6·7	<13·5	May 29.	406
R Draconis ...	32 25	+66 56·3	6·4	13·0	April 3, Dec. 5.	245
S Draconis ...	41 7	+55 4·2	7·5	10·0	Feb. 12, Dec. 8.	300
S Herculis ...	48 2	+15 4·8	5·9	13·1	May 29.	308
R Ophiuchi ...	17 2 53	−15 59·1	6·0	13·6	April 16.	302
Z Ophiuchi ...	15 14	+ 1 36·1	7·6	12·6	April 23.	349
RS Herculis ...	18 9	+23 0·3	7·5	12·8	June 14.	220
T Draconis ...	55 6	+58 13·4	7·5	12·0	(1917, Feb. 7.)	426
T Herculis ...	18 5 53	+31 0·5	6·9	13·3	Jan. 16, June 29, Dec. 11.	165
W Lyræ	11 59	+36 38·6	7·3	12·5	Feb. 4, Aug. 18.	196
X Ophiuchi ...	34 17	+ 8 45·6	6·5	9·5	Sept. 14,	335
R Aquilæ	19 2 16	+ 8 6·2	6·2	11·2	Nov. 15.	335
T Sagittarii ...	11 20	−17 7·2	7·2	<13	Nov. 7.	381
R Sagittarii ...	11 42	−19 27·5	7·0	<13	Aug. 6.	269
AF Cygni	27 40	+45 57·9	6·9	8·0	Feb. 18, May 27, Sept. 3, Dec. 11.	99
R Cygni	34 33	+50 0·3	5·9	13·8	Aug. 16.	426
RT Cygni	41 15	+48 33·9	6·6	12·2	Apr. 11, Oct. 18.	190
χ Cygni	47 19	+32 42·0	4·2	13·2	Feb. 3.	408
Z Cygni	59 3	+49 48·1	7·1	13·8	Jan. 9, Sept. 27.	263
U Cygni	20 16 59	+47 37·7	6·1	11·8	(1917, Mar. 12.)	464
V Cygni	38 34	+47 50·1	6·8	13·8	Dec. 4.	418
T Aquarii	45 27	− 5 27·7	6·8	13·4	May 9, Nov. 28.	203
UX Cygni	51 33	+30 5·6	7·4	<13	(1917, Feb. 12.)	565
R Vulpeculæ...	21 0 36	+23 28·7	7·1	13·6	April 14, Aug. 29.	137
T Cephei	8 22	+68 8·8	5·2	10·8	Dec. 28.	387
S Cephei	36 21	+78 14·4	7·0	12	Feb. 24.	486
RU Cygni	37 46	+53 56·2	7·5	10·3	May 1.	436
R Pegasi	23 2 23	+10 4·9	6·9	13·0	Dec. 30.	377
V Cassiopeiæ ..	8 1	+59 13·6	7·1	12·6	July 26.	230
W Pegasi	15 30	+25 49·0	7·3	13·0	May 30.	342
S Pegasi	16 15	+ 8 27·4	7·3	13·1	April 3.	318
SV Cassiopeiæ.	34 55	+51 47·4	7·5	9·2	Feb. 28, Nov. 26.	272
R Aquarii	39 26	−15 45·5	6·0	10·8	Dec. 15.	387
V Cephei	52 21	+82 42·8	6·2	7·0	Nov. 10.	362
R Cassiopeiæ ..	54 15	+50 54·7	4·8	13·2	(1917, Mar. 1.)	432

IRREGULAR VARIABLE STARS. (Selected List.)

Star.	R.A. 1915·0	Dec. 1915·0	Magnitude. Max.	Magnitude. Min.
	h m	° ′		
ρ Persei	2 59·7	+38 26	3·3	4·1
W Orionis	5 1·0	+ 1 4	5·9	7·7
Y Tauri	5 40·6	+20 40	6·9	8·9
α Orionis	5 50·6	+ 7 23	0·5	1·1
U Monocerotis	7 26·7	− 9 36	5·4	7·2
U Geminorum	7 50·1	+22 14	8·8	13·8
U Hydræ	10 33·4	−12 56	4·8	6·7
η Carinæ	10 41·8	−59 14	−1	7·8
R Coronæ Bor.	15 45·1	+28 25	5·8	<13·8
g Herculis	16 25·8	+42 4	4·7	5·5
α Herculis	17 10·8	+14 29	3·1	3·9
R Scuti	18 43·0	− 5 48	4·5	9
RY Sagittarii	19 11·0	−33 40	6·6	<11·5
SS Cygni	21 39·4	+43 11	8·1	12
μ Cephei	21 40·9	+58 23	4·0	4·8

SHORT PERIOD VARIABLE STARS. (SELECTED LIST.)

Star.	R.A. 1915·0	Dec. 1915·0	Magnitude.		Period in days.
			Max.	Min.	
	h m	° ′	m	m	
α Ursæ Min.	1 11·8	+88 51	2·3	2·4	3·9681
T Monocerotis	6 20·6	+ 7 8	6 0	6·8	27·0122
RT Aurigæ	6 23·1	+30 33	5·0	5·9	3·7282
ζ Geminorum	6 59·0	+20 42	3·7	4·1	10·15382
T Velorum	8 35·6	−47 8	7·7	8·5	4·6392
l Carinæ	9 42·7	−62 7	3·6	5·0	35·523
ST Ursæ Maj.	11 23·2	+45 39	6·7	7·8	8·8 ?
R Crucis	12 20·0	−61 16	6·8	7·9	5·82485
R Muscæ	12 38·1	−69 2	6·7	7·6	0·88247
R Trianguli Aust. ...	15 13·9	−66 15	6·7	7·4	3·38922
X Sagittarii	17 43·5	−27 49	4·4	5·0	7·01188
Y Ophiuchi	17 48·1	− 6 7	6·2	7·0	17·121
W Sagittarii	18 0·9	−29 35	4·3	5·1	7·5946
Y Sagittarii	18 16·4	−18 54	5·8	6·6	5·7734
κ Pavonis	18 50·3	−67 19	3·8	5·2	9·092
η Aquilæ	19 48·1	+ 0 47	3·7	4·3	7·176
S Sagittæ	19 52·2	+16 24	5·4	6·1	8·381613
X Cygni	20 40·1	+35 17	6·2	7·4	16·38543
T Vulpeculæ	20 47·9	+27 58	5·5	6·4	4·435521
δ Cephei	22 26 0	+57 59	3·6	4·3	5·366386

MINIMA OF ALGOL, 1916.

R.A. 3^h 3^m. Dec. +40° 38′. Range $2^{m}\cdot3$–$3^{m}\cdot5$. Duration of Eclipse $9^{h}\cdot3$.
Every third minimum is given. Period $2^{d}\cdot86731$.

	d		d		d		d
Jan.	2·101	Apr.	5·722	July	9·344	Oct.	3·363
	10·703		14·324		17·946		11·965
	19·305		22·926		26·548		20·567
	27·907	May	1·528	Aug.	4·150		29·169
Feb.	5·509		10·130		12·752	Nov.	6·771
	14·111		18·732		21·354		15·373
	22·713		27·334		29·956		23·975
Mar.	2·315	June	4·936	Sept.	7·557	Dec.	2·577
	10·916		13·538		16·159		11·178
	19·518		22·140		24·761		19·780
	28·120		30·742				28·382

PRINCIPAL MINIMA OF β LYRÆ, 1916.

R.A. 18^h 47^m. Dec. +33° 15′. Range $3^{m}\cdot4$–$4^{m}\cdot1$. Period $12^{d}\cdot921$.

	d		d		d		d
Jan.	5·654	Apr.	5·101	July	4·548	Oct.	2·995
	18·575		18·022		17·469		15·916
Feb.	0·496	May	0·943		30·390		28·837
	13·417		13·864	Aug.	12·311	Nov.	10·758
	26·338		26·785		25·232		23·679
Mar.	10·259	June	8·706	Sept.	7·153	Dec.	6·600
	23·180		21·627		20·074		19·521

Minima of Variable Stars of the Algol Type, 1916.

	U Cephei.	RZ Cassiop.	λ Tauri.	RW Tauri.	R Canis Maj.
R.A.	$0^{h}\ 54^{m}{\cdot}8$	$2^{h}\ 41^{m}{\cdot}4$	$3^{h}\ 56^{m}{\cdot}0$	$3^{h}\ 58^{m}{\cdot}7$	$7^{h}\ 15^{m}{\cdot}7$
Dec.	+81° 25′	+69° 17′	+12° 15′	+27° 54′	−16° 14′
Range	6·9–9·1	6·4–7·7	3·8–4·2	7·9–11·5	5·8–6·4
Period	$2^{d}{\cdot}49288$	$1^{d}{\cdot}19525$	$3^{d}{\cdot}95294$	$2^{d}{\cdot}76890$	$1^{d}{\cdot}13595$
Minima:	d	d	d	d	d
Jan.	0·269	0·483	3·446	1·437	1·054
Feb.	1·677	0·558	0·117	0·895	0·726
March	0·098	0·246	2·742	2·353	0·125
April	1·506	0·321	3·367	1·811	0·933
May	1·421	0·204	1·038	2·269	0·466
June.........	0·336	0·279	1·663	1·727	0·138
July	0·251	0·162	3·288	2·185	0·807
Aug.	1·658	0·237	3·913	1·643	0·479
Sept.	0·573	0·312	0·584	1·101	0·148
Oct.	0·488	0·195	2·209	1·559	0·820
Nov.	1·895	0·270	2·834	1·017	0·489
Dec.	1·810	0·153	0·505	1·475	0·022
Duration of:	h	h	h	h	h
(*a*) Eclipse ...	11·5	5·7	10·5	7·9	6
(*b*) Minimum .	1·4	0·4	0	1·3	0

	S Cancri.	S Velorum.	RW Ursæ Maj.	SW Centauri.	SZ Centauri.
R.A.	$8^{h}\ 39^{m}{\cdot}1$	$9^{h}\ 30^{m}{\cdot}1$	$11^{h}\ 36^{m}{\cdot}2$	$12^{h}\ 13^{m}{\cdot}3$	$13^{h}\ 44^{m}{\cdot}9$
Dec.	+19° 20′	−44° 50′	+52° 29′	−49° 16′	−58° 5′
Range	8·3–10·0	7·8–9·3	10·4–11·4	9·1–11·6	8·2–8·8
Period	$9^{d}{\cdot}48455$	$5^{d}{\cdot}93358$	$7^{d}{\cdot}3284$	$5^{d}{\cdot}21943$	$2^{d}{\cdot}05398$
Minima :	d	d	d	d	d
Jan.	7·818	2·729	0·475	1·534	0·233
Feb.	5·272	1·396	6·116	1·851	0·043
March	4·725	2·063	6·429	4·168	1·853
April	2·178	0·730	4·742	4·485	1·663
May.........	0·632	0·397	4·055	0·581	0·419
June	7·570	4·998	2·368	0·898	0·229
July.........	6·023	4·665	1·681	2·215	1·039
Aug.........	3·476	3·332	7·322	2·532	0·849
Sept.	0·932	1·999	5·635	2·849	1·659
Oct.	8 870	1·666	4·948	4·166	1·469
Nov.........	6·324	0·333	3·261	4·483	1·279
Dec.........	4·777	0·000	2·574	0·579	0·035
Duration of :	h	h	h	h	h
(*a*) Eclipse ...	21·1	15·0	13·9	14·5 ?	17
(*b*) Minimum .	3·4	6·3	4·3	...	2

Minima of Variable Stars of the Algol Type (continued).

	U CORONÆ BOR.	TW DRACONIS.	R ARÆ.	U OPHIUCHI.	Z HERCULIS.
R.A.	$15^{h}\ 14^{m}{\cdot}8$	$15^{h}\ 32^{m}{\cdot}6$	$16^{h}\ 32^{m}{\cdot}8$	$17^{h}\ 12^{m}{\cdot}2$	$17^{h}\ 54^{m}{\cdot}3$
Dec.	31° 58′	+64° 11′	−56° 50′	+1° 18′	+15° 9′
Range	7·9–9·1	7·6–10·1	6·8–7·9	6·0–6·8	7·1–8·3
Period	$3^{d}{\cdot}45221$	$2^{d}{\cdot}80652$	$4^{d}{\cdot}42509$	$1^{d}{\cdot}67735$	$3^{d}{\cdot}99277$
Minima:	d	d	d	d	d
Jan.	2·454	2·404	3·433	0·096	1·300
Feb.	2·524	2·275	3·408	0·964	2·242
March	1·140	1·342	0·958	0·481	1·192
April	1·210	1·213	0·933	1·349	2·134
May	2·280	2·084	1·908	1·541	0·084
June	2·350	1·955	1·883	0·733	1·026
July	3·420	0·022	2·858	0·925	2·968
Aug.	0·037	2·701	2·833	0·118	3·910
Sept.	0·107	2·572	2·808	0·989	0·860
Oct.	1·177	0·639	3·783	1·179	2·802
Nov.	1·248	0·510	3·758	0·370	3·744
Dec.	2·318	1·381	0·308	0·562	1·694
Duration of :	h	h	h	h	h
(*a*) Eclipse ...	10·6	9·4	9·2	7·7	11
(*b*) Minimum.	1·2 ?	1·4	0	0	1·2

	RX HERCULIS.	RS VULPECULÆ.	U SAGITTÆ.	Z VULPECULÆ.	Y CYGNI.
R.A.	$18^{h}\ 26^{m}{\cdot}8$	$19^{h}\ 14^{m}{\cdot}1$	$19^{h}\ 15^{m}{\cdot}1$	$19^{h}\ 18^{m}{\cdot}2$	$20^{h}\ 48^{m}{\cdot}7$
Dec.	+12° 33′	+22° 17′	+19° 27′	+25° 25′	+34° 20′
Range	7·1–7·7	7·4–8·1	6·8–9·4	7·3–8·8	7·1–7·9
Period	$0^{d}{\cdot}88929$	$4^{d}{\cdot}47750$	$3^{d}{\cdot}38060$	$2^{d}{\cdot}45492$	$2^{d}{\cdot}99633$
Minima:	d	d	d	d	d
Jan.	0·682	3·280	2·981	2·401	0·380
Feb.	0·808	3·622	2·406	0·860	2·339
March	0·266	1·488	0·452	1·319	0·306
April	0·392	1·830	3·258	2·233	2·265
May	0·628	3·172	0·304	1·692	2·228
June	0·753	3·514	3·110	0·151	1·191
July	0·989	0·380	0·156	2·065	1·154
Aug.	0·225	0·722	2·962	0·524	0·117
Sept.	0·350	1·064	2·387	1·438	2·076
Oct.	0·586	2·406	2·812	0·897	2·039
Nov.	0·711	2·748	2·237	1·811	1·002
Dec.	0·946	4·090	2·662	1·270	0·965
Duration of :	h	h	h	h	h
(*a*) Eclipse ..	4·6	11·0	11·5	9	8
(*b*) Minimum.	0	4·8	1·7	0	0

Maxima of Variable Stars of Antalgol Type.

	SW ANDROMEDÆ.	SU DRACONIS.	SW DRACONIS.	RS BOÖTIS.	XZ CYGNI.
R.A.	$0^{h}\ 19^{m}\cdot3$	$11^{h}\ 33^{m}\cdot2$	$12^{h}\ 13^{m}\cdot6$	$14^{h}\ 30^{m}\cdot0$	$19^{h}\ 30^{m}\cdot8$
Dec.	$+28°\ 56'$	$+67°\ 48'$	$+69°\ 59'$	$+32°\ 7'$	$+56°\ 12'$
Range	9·2–10·0	8·9–9·6	8·3–10·4	9·2–10·2	8·7–9·3
Period	$0^{d}\cdot44185$	$0^{d}\cdot66043$	$0^{d}\cdot56965$	$0^{d}\cdot37733$	$0^{d}\cdot46659$
Maxima:	d	d	d	d	d
Jan.	0·439	0·377	0·340	0·363	0·053
Feb.	0·368	0·416	0·101	0·304	0·315
March	0·088	0·475	0·154	0·360	0·244
April	0·017	0·514	0·485	0·301	0·040
May	0·063	0·232	0·107	0·111	0·369
June	0·434	0·271	0·438	0·052	0·165
July	0·038	0·650	0·060	0·239	0·027
Aug.	0·409	0·029	0·391	0·180	0·289
Sept.	0·338	0·068	0·152	0·121	0·085
Oct.	0·384	0·447	0·344	0·308	0·414
Nov.	0·313	0·486	0·105	0·249	0·210
Dec.	0·359	0·204	0·297	0·059	0·072
Duration of:	h	h	h	h	h
(*a*) Rise......	1·3	3·6	3	1·4	2·5
(*b*) Fall	4	7	10·5	4·8	5

Minima of Variable Stars of β Lyræ Type.

	SX CASSIOP.	TT AURIGÆ.	V PUPPIS.	*u* HERCULIS.	TV ANDROMEDÆ.
R.A.	$0^{h}\ 6^{m}\cdot3$	$5^{h}\ 3^{m}\cdot9$	$7^{h}\ 55^{m}\cdot8$	$17^{h}\ 14^{m}\cdot2$	$22^{h}\ 54^{m}\cdot2$
Dec.	$+54°\ 25'$	$+39°\ 28'$	$-49°\ 0'$	$+33°\ 11'$	$+42°\ 17'$
Range	8·6–9·7	8·7–9·8	4·1–4·9	4·8–5·3	9·0–10·7
Period	$36^{d}\cdot572$	$1^{d}\cdot33271$	$1^{d}\cdot45448$	$2^{d}\cdot05102$	$126^{d}\cdot8$
Principal Minima:	d	d	d	d	d
Jan.	9·989	0·740	0·846	1·044	...
Feb.	15·561	0·394	0·390	0·809	...
March	23·133	0·713	0·480	0·523	...
April	28·705	0·367	0·024	0·288	1
May	...	1·018	0·568	1·053	...
June	4·277	0·672	0·112	0·818	...
July	10·849	1·326	0·656	1·583	...
Aug.	16·421	0·980	0·200	1·348	6
Sept.	21·993	0·634	1·198	1·113	...
Oct.	28·565	1·288	0·288	1·879	...
Nov.	...	0·942	1·286	1·645	...
Dec.	4·137	0·263	0·376	0·359	11

DOUBLE STARS.

No.	Star's name.	R.A. 1910.	Dec. 1910.	Mag.	Pos.-angle.	Distance.	Epoch 1900+.	Observer.
		h m	° ′		°	″		
1.	Σ 3062	0 1·5	+57 56	6½; 7½	12·7	1·68	13·73	B.
2.	OΣ 2	0 8·8	+26 29	7; 8	35·3	0·32	14·90	J.
3.	OΣ 12, λ Cassiop.	0 26·8	+54 2	5½; 6	160·6	0·44	15·10	B.
4.	Innes 260, β_2 Toucani.	0 27·6	−63 28	4½; 6½	268·7	0·67	13·88	I.
5.	Ho. 212, 13 Ceti	0 30·6	− 4 6	5½; 6½	221·4	0·21	12·65	A.
6.	Σ 60, η Cassiop.	0 43·6	+57 20	4; 7½	249·6	6·76	15·61	J.
7.	β 302	0 53·5	+20 55	6½; 8	110·9	0·61	14·82	J.
8.	Σ 73, 36 Androm.	0 50·1	+23 8	6; 6½	35·7	1·00	14·85	H.F.
9.	OΣ 515, φ Androm.	1 5·2	+50 42	4½; 6	202·2	0·32	15·10	B.
10.	Σ 113	1 15·2	− 0 58	6; 7	0·4	1·29	14·85	J.
11.	*h* 3430	1 16·9	−57 49	7½; 10	236·6	2·43	14·88	Hu.
12.	OΣ 31	1 28·6	+ 7 45	7; 11	81·4	3·44	13·89	H.F.
13.	*p* Eridani	1 37·0	−56 39	6; 6	205·4	8·55	13·80	Hu.
14.	Σ 149	1 39·2	+39 30	8; 9½	105·8	1·16	11·09	W.B.
15.	Σ 186	1 51·2	+ 1 24	7; 7	35·6	0·82	14·85	J.
16.	Σ 202, α Piscium	1 57·4	+ 2 20	3; 4	310·5	2·41	13·92	W.B.
17.	OΣ 38, γ Androm. BC.	1 58·4	+41 54	3; 5	107·6	0·50	15·12	J.
18.	Σ 205, γ Androm. AB.	……	……	5; 6	63·4	10·49	15·12	J.
19.	Σ 228	2 8·3	+47 4	6½; 7½	112·4	0·66	15·11	B.
20.	OΣ 43	2 35·5	+26 14	7; 9	43·8	1·06	13·02	W.B.
21.	Σ 305	2 42·4	+19 0	7; 8	312·1	3·13	14·85	J.
22.	Σ 333, ε Arietis	2 54·1	+20 59	5½; 6	203·4	1·39	13·06	W.B.
23.	Σ 381	3 18·1	+20 40	7; 9	106·1	0·68	14·88	J.
24.	Ho. 504	3 38·8	+35 34	8; 8	186·8	1·08	11·88	H.F.
25.	β 1004	3 58·6	−34 44	6½; 8½	136·3	2·04	13·98	I.
26.	OΣ 531	4 1·6	+37 50	6½; 8	126·4	1·60	13·15	W.B.
27.	OΣ 77	4 10·1	+31 29	7½; 7½	222·7	0·39	14·10	B.
28.	Σ 518, o^2 Eridani AB.	4 11·3	− 7 50	4½; 9	105·2	82·62	12·05	A.
29.	„ „ BC.	……	……	9; 10½	29·5	2·88	12·11	J.
30.	Σ 567	4 31·4	+19 19	8½; 9	323·4	1·65	12·02	W.B.
31.	OΣ 95	5 0·2	+19 41	6½; 7	322·5	0·91	13·05	H.F.
32.	OΣ 98	5 3·0	+ 8 23	6; 7	148·7	0·92	13·15	W.B.
33.	J 323	5 5·0	+10 48	7½; 9½	167·5	3·21	15·01	J.
34.	Σ 749	5 31·5	+26 52	7; 7	349·9	1·10	12·12	J.
35.	J 677 AB	5 45·8	+17 52	8½; 11	72·0	1·68	12·48	A.
36.	Σ 806 AC	……	……	8½; 8½	197·7	10·76	12·48	A.
37.	A 2715, μ Orionis	5 57·4	+ 9 39	4; 6½	32·0	0·36	14·74	A.
38.	J 335	5 59·2	+11 2	7½; 9½	298·8	0·77	15·12	H.F.
39.	J 53	6 19·1	+ 2 42	6½; 10½	127·5	1·77	15·12	J.
40.	OΣ 149	6 30·8	+27 22	6½; 9	269·6	0·55	11·15	W.B.
41.	Sirius	6 41·2	−16 35	1; 10	78·9	10·01	15·07	J.
42.	OΣ 170	7 12·7	+ 9 28	7½; 7½	105·4	1·66	14·08	W.B.
43.	Σ 1110 Castor.	7 28·9	+32 5	2½; 3½	218·7	5·40	14·22	W.B.
44.	Procyon	7 34·6	+ 5 28	1; 10	29·0	6·14	14·30	W.B.
45.	Σ 1126	7 35·3	+ 5 26	7; 7½	147·8	1·17	15·20	J.
46.	OΣ 182	7 48·0	+ 3 38	7; 7½	29·1	1·03	13·09	W.B.
47.	Σ 1157	7 50·0	− 2 34	8; 8	244·2	1·22	13·24	B.
48.	β 581, AB	7 59·4	+12 33	8; 8	319·5	0·48	15·23	H.F.
49.	„ AC	……	……	8; 10½	198·8	5·13	15·23	H.F.
50.	Σ 1196, ζ Cancri AB.	8 7·1	+17 56	5; 5½	306·8	1·03	15·35	J.
51.	„ „ AC.	……	……	5; 5½	112·8	4·98	13·20	W.B.
52.	„ „ BC.	……	……	5½; 5½	116·8	5·85	13·25	W.B.
53.	Σ 1273, ε Hydræ AB.	8 42·0	+ 6 46	4; 5½	265·4	0·20	14·26	A.
54.	„ „ AC.	……	……	4; 7½	243·5	3·42	14·26	W.B.
55.	J 77	9 0·2	+10 51	8½; 8½	139·3	0·98	15·24	H.F.

DOUBLE STARS (*continued*).

No.	Star's name.	R.A. 1910.	Dec. 1910.	Mag.	Pos.-angle.	Distance.	Epoch 1900+.	Observer.
		h m	° ′		°	″		
56.	Σ 3121	9 12·6	+28 58	7½ ; 8	186·1	0·35	12·12	A.
57.	Σ 1356, ω Leonis	9 23·6	+ 9 27	6 ; 7	125·1	0·86	15·31	J.
58.	A. Clark 5	9 48·0	− 7 40	5 ; 5	66·3	0·50	15·28	B.
59.	OΣ 215	10 11·5	+18 12	6½ ; 7	201·3	0·91	15·31	J.
60.	Σ 1424, γ Leonis	10 15·0	+20 18	2 ; 3½	118·4	3·98	15·35	J.
61	Σ 1426, AB	10 15·8	+ 6 53	7½ ; 8	285·6	0·84	14·31	H.F.
62.	„ AC	……	……	7½ ; 9½	8·9	7·84	14·29	W.B.
63.	OΣ 220	10 24·5	+10 37	7 ; 9	70·6	1·21	15·31	H.F.
64.	Σ 1457	10 34·0	+ 6 12	7½ ; 8½	320·2	1·24	14·25	W.B.
65.	OΣ 229	10 42·9	+41 37	6½ ; 7	313·0	0·84	14·37	W.B.
66.	Σ 1500	10 55·6	− 3 0	7½ ; 8	305·6	1·38	15·31	H.F.
67.	Σ 1504	10 59·4	+ 4 7	7½ ; 7½	104·0	1·10	15·31	H.F.
68.	Σ 1517	11 9·0	+20 38	7½ ; 7½	72·9	0·22	14·25	W.B.
69.	Σ 1523, ζ Urs. Maj.	11 13·4	+32 3	4 ; 5	114·7	3·13	15·43	J.
70.	Σ 1536, ι Leonis	11 19·2	+11 2	4 ; 7	46·3	2·27	14·35	H.F.
71.	L 11	11 24·5	+30 56	7 ; 11	4·4	1·24	15·21	J.
72.	J 85, BAC 3917	11 26·8	+ 3 34	7 ; 14	167·4	4·73	15·21	J.
73.	J 87	11 36·4	+ 5 27	8 ; 12	136·7	1·68	15·31	H.F.
74.	Σ 1670, γ Virginis	11 37·2	− 0 57	3 ; 3	324·6	5·90	14·40	B.
75.	β 603	11 44·0	+14 47	6 ; 10	293·5	0·88	14·25	W.B.
76.	β 605	12 15·5	−21 40	6 ; 8½	149·2	0·71	13·38	I.
77.	Σ 1639	12 19·9	+26 5	6½ ; 8	341·5	0·51	15·39	J.
78.	Σ 1647	12 26·0	+10 13	7½ ; 8	226·0	1·45	14·40	W.B.
79.	Σ 1658	12 30·5	+ 7 57	8½ ; 10	2·2	2·62	14·29	W.B.
80.	γ Centauri	12 36·5	−48 28	3 ; 3	348·1	1·13	13·48	I.
81.	Σ 1670	12 37·2	− 0 57	3 ; 3	324·5	5·95	14·30	W.B.
82.	β Muscæ	12 41·0	−67 38	4 ; 4	349·4	1·20	11·37	I.
83.	J 432	12 41·0	+ 4 1	8 ; 8½	263·1	0·74	15·31	H.F.
84.	Σ 1687, 35 Comæ	12 48·9	+21 44	5 ; 8	90·4	1·30	14·29	H.F.
85.	β 341	12 58·9	−20 6	6 ; 6½	313·8	0·79	15·37	B.
86.	β 929	12 59·3	− 3 11	6 ; 6½	209·9	0·60	14·43	B.
87.	Σ 1728, 42 Comæ	13 5·6	+18 0	6 ; 6	10·2	0·56	15·31	J.
88.	OΣ 261	13 7·8	+32 33	7 ; 7	343·2	1·77	14·49	W.B.
89.	Σ 1757	13 29·7	+ 0 9	7½ ; 9	84·5	2·30	13·40	H.F.
90.	Σ 1768, 25 Can. Ven.	13 33·5	+36 45	5 ; 8½	119·4	1·39	14·46	W.B.
91.	OΣ 266	13 34·1	+16 11	7 ; 7½	344·5	1·69	15·28	J.
92.	Σ 1785	13 45·0	+27 26	7 ; 7½	335·4	1·27	14·38	B.
93.	Σ 1829	14 10·8	+ 3 33	8 ; 8	346·6	1·13	11·43	W.B.
94.	Σ 1835	14 19·0	+18 52	5½ ; 6½	189·7	6·53	15·39	J.
95.	α Centauri	14 33·3	−60 28	1 ; 1	217·6	18·26	13·43	I.
96.	Σ 1865, ζ Boötis	14 36·9	+14 7	3½ ; 4	139·5	0·64	15·46	B.
97.	Σ 1877, ε Boötis	14 41·1	+27 27	3 ; 6	330·2	2·87	14·43	W.B.
98.	Σ 1888, ξ Boötis	14 47·2	+19 28	5 ; 6½	106·6	2·03	14·43	W.B.
99.	OΣ 287	14 48·2	+45 18	7½ ; 7½	327·1	0·87	14·50	W.B.
100.	OΣ 288	14 49·9	+16 5	6½ ; 7	188·4	1·66	12·35	W.B.
101.	Σ 1910	15 3·2	+19 34	7 ; 7	210·3	4·14	14·42	W.B.
102.	Σ 1932, 1 Coronæ	15 14·5	+27 9	5½ ; 6	3·5	0·70	15·41	B.
103.	Σ 1937, η Coronæ	15 19·5	+30 36	5½ ; 6	51·5	1·05	14·52	B.
104.	Σ 1938, μ^2 Boötis	15 21·1	+37 40	6½ ; 7	54·5	1·21	14·46	W.B.
105.	OΣ 298	15 31·9	+40 6	7 ; 7½	200·4	1·21	14·38	B.
106.	Σ 1967, γ Coronæ	15 39·0	+26 35	4 ; 7	110·7	0·72	15·41	B.
107.	OΣ 303	15 57·3	+13 32	7½ ; 8	148·1	0·86	14·47	W.B.
108.	β 120, AB	16 6·8	−19 14	4 ; 6½	6·5	0·93	15·41	B.
109.	Mitchell, CD	……	……	7 ; 8	50·3	2·24	15·41	B.
110.	Σ 2032, σ Coronæ	16 11·3	+34 5	5 ; 6	217·6	5·15	14·50	W.B.

DOUBLE STARS (*continued*).

No.	Star's name.	R.A. 1910.		Dec. 1910.		Mag.		Pos.-angle.	Distance.	Epoch 1900+.	Observer.
		h	m	°	′			°	″		
111.	Σ 2055, λ Ophiuchi ...	16	26·4	+ 2	11	4 ;	6	72·3	1·05	14·47	W.B.
112.	Σ 2084, ζ Herculis ...	16	37·9	+31	45	3 ;	6½	108·0	1·25	15·54	B.
113.	De 15....................	16	41·1	+43	39	8 ;	8½	269·5	0·42	12·58	A.
114.	β 1117, 24 Ophiuchi .	16	50·2	−22	0	6 ;	6½	281·6	0·62	12·57	A.
115.	Σ 3107	16	54·4	+ 4	6	8½ ;	8½	100·0	1·58	13·50	W.B.
116.	β 1118, η Ophiuchi ...	17	5·2	−15	36	3½ ;	4	240·3	0·41	15·53	B.
117.	Σ 2140, α Herculis ...	17	10·5	+14	30	3 ;	6	114·8	4·80	14·51	H.F.
118.	Aitken, 41 Ophiuchi .	17	12·2	− 0	21	4½ ;	7½	298·3	0·52	15·54	A.
119.	Brisbane	17	12·2	−46	33	5½ ;	8½	144·5	2·19	13·56	I.
120.	β 962, μ Draconis ...	17	35·1	+28	5	5½ ;	10	350·0	0·90	13·87	W.B.
121.	A. C. 7, μ Herculis, BC	17	43·0	+27	43	9½ ;	10½	113·8	0·67	12·57	A.
122.	Σ 2262, τ Ophiuchi ...	17	58·2	− 8	11	5 ;	5½	260·1	1·92	13·55	W.B.
123.	Σ 2272, 70 Ophiuchi .	18	0·9	+ 2	33	4½ ;	6	141·3	4·82	15·73	J.
124.	A. C. 15	18	3·6	+30	33	6 ;	10½	345·1	1·21	15·65	J.
125.	Σ 2339, AC	18	29·8	+17	39	8 ;	8	271·1	2·24	14·67	W.B.
126.	Hu 322, AB	......		......		8 ;	8½	72·9	0·31	14·76	W.B.
127.	OΣ 358	18	31·9	+16	54	7 ;	7	6·9	1·89	12·71	J.
128.	β 137	18	50·8	+37	16	8 ;	8½	136·9	1·12	11·78	W.B.
129.	Winlock, ζ Sagittarii .	18	56·9	−30	0	3½ ;	3½	251·3	0·62	12·56	A.
130.	*h* 5084, γ Coronæ Aust.	19	0·3	−37	12	5½ ;	5½	105·9	1·92	12·56	A.
131.	Σ 2525	19	22·9	+27	8	7½ ;	8	297·5	0·90	15·69	B.
132.	Σ 2579, δ Cygni	19	42·2	+44	54	3 ;	8	288·0	2·05	14·88	J.
133.	Σ 2596	19	49·9	+15	4	7 ;	8½	322·0	1·78	14·82	J.
134.	Σ 2672	20	17·7	+23	29	8½ ;	9	298·7	0·82	12·68	W.B.
135.	Σ 2695	20	28·1	+25	30	7 ;	8	79·8	1·01	14·70	W.B.
136.	β 151	20	33·3	+14	17	4½ ;	6	306·7	0·25	15·65	J.
137.	OΣ 413, λ Cygni	20	43·9	+36	10	5 ;	6	57·1	0·73	15·65	B.
138.	Σ 2729, 4 Aquarii ...	20	46·7	− 5	57	6 ;	7	324·2	0·43	12·58	A.
139	OΣ 417	20	49·3	+28	48	7½ ;	8	26·6	0·65	11·77	W.B.
140.	Σ 2749, AB	21	0·2	+ 3	10	7 ;	8½	162·2	3·23	14·84	J.
141.	Secchi 3, BC	......		......		9 ;	9	165·5	0·89	14·84	J.
142.	OΣ 535, δ Equulei ...	21	9·9	+ 9	37	4½ ;	5	20·3	0·36	15·65	J.
143.	OΣ 437	21	17·0	+32	3	6½ ;	7	41·4	1·80	12·83	W.B.
144.	Σ 2799	21	24·5	+10	40	6½ ;	6½	292·9	1·34	14·88	J.
145.	Σ 2822, μ Cygni	21	40·1	+28	19	4 ;	5	132·5	1·72	14·86	J.
146.	β 989, κ Pegasi.........	21	40·6	+25	13	4½ ;	5	142·1	0·20	15·65	J.
147.	β 75	21	51·0	+10	27	8 ;	8½	49·4	0·98	14·70	W.B.
148.	β 172	22	19·4	− 5	18	6½ ;	6½	356·0	0·66	12·72	A.
149.	Σ 2909, ζ Aquarii......	22	24·1	− 0	30	4 ;	4	307·0	2·81	14·92	J.
150.	Σ 2934	22	37·4	+21	3	8 ;	9	122·3	0·74	12·79	W.B.
151.	β 711	22	40·8	+10	43	8½ ;	10½	29·2	1·05	14·81	H.F.
152.	OΣ 483, 52 Pegasi ...	22	54·5	+11	15	6 ;	7½	235·5	1·07	14·70	W.B.
153.	β 79	23	12·8	− 2	0	8 ;	9½	64·2	1·01	14·72	B.
154.	β 720	23	29·4	+30	49	6 ;	6	187·3	0·36	15·65	J.
155.	β 858	23	37·6	+32	1	7½ ;	8	252·9	0·69	8·05	H.F.
156.	Σ 3033	23	39·3	+ 6	45	8½ ;	8½	7·2	3·35	14·85	H.F.
157.	Σ 3050	23	55·0	+33	14	6 ;	6½	221·4	2·33	12·74	A.
158.	β 733, 85 Pegasi	23	57·3	+26	37	6 ;	12½	123·1	0·63	15·65	J.

In the column headed "Observer," the following abbreviations are used:—

A. Aitken.
W.B. Bowyer.
B. Bryant.
H.F. Furner.
Hu. Hussey.
I. Innes.
J. Jonckheere.

THE PRINCIPAL STAR-CLUSTERS AND NEBULÆ.

Catalogue Designation.	R.A.	Dec.	Constellation.	Description.
	h m	° ′		
N.G.C. 104 ...	0 20	−72 35	Toucanus.	Fine globular cluster, 47 Toucani.
M. 31	0 38	+40 46	Andromeda.	Great nebula.
M. 33	1 29	+30 13	Triangulum.	Large spiral nebula.
H. vi. 33–34 ...	2 14	+56 45	Perseus.	Double cluster in the sword-handle.
M. 34	2 36	+42 21	Perseus.	Coarse cluster (for low-power).
M. 1	5 29	+21 57	Taurus.	The "Crab" nebula.
M. 42	5 31	− 5 27	Orion.	The great nebula in Orion.
N.G.C. 2070 ...	5 39	−69 9	Doradus.	Large irregular nebula.
M. 37	5 46	+32 31	Auriga.	Globular cluster.
M. 35	6 3	+24 26	Gemini.	Large globular cluster.
M. 41	6 43	−20 29	Canis Major.	Large coarse cluster.
M. 46	7 38	−14 30	Puppis.	Large coarse cluster.
M. 44	8 35	+20 15	Cancer.	"Præsepe," the bee-hive cluster.
M. 81	9 48	+69 33	Ursa Major.	Spiral nebula.
N.G.C. 3372 ...	10 42	−59 13	Argo Navis.	"Keyhole" nebula round η Argûs.
M. 97	11 9	+55 30	Ursa Major.	"Owl" nebula.
N.G.C. 4755 ...	12 49	−59 56	Crux.	The "jewel-casket."
M. 64	12 52	+22 10	Coma Berenices.	Bright elliptical nebula.
M. 53	13 9	+18 39	Coma Berenices.	Globular cluster.
N.G.C. 5139 ...	13 21	−46 50	Centaurus.	Great globular cluster, ω Centauri.
M. 51	13 26	+47 39	Canes Venatici.	"Whirlpool" nebula.
M. 3	13 38	+28 49	Canes Venatici.	Bright globular cluster.
M. 5	15 14	+ 2 26	Libra.	Bright globular cluster.
M. 13	16 38	+36 37	Hercules.	Great globular cluster.
M. 12	16 43	− 1 48	Ophiuchus.	Globular cluster.
M. 10	16 52	− 3 59	Ophiuchus.	,, ,,
M. 62	16 56	−29 57	Scorpius.	,, ,,
M. 19	16 57	−26 8	Ophiuchus.	,, ,,
M. 9	17 14	−18 26	Ophiuchus.	,, ,,
M. 92	17 14	+43 14	Hercules.	,, ,,
M. 14	17 33	− 3 12	Ophiuchus.	,, ,,
M. 20	17 57	−23 2	Sagittarius.	"Trifid" nebula.
M. 8	17 58	−24 23	Sagittarius.	Irregular nebula and cluster.
H. iv. 37	17 59	+66 38	Draco.	Bright planetary nebula.
M. 24	18 13	−18 26	Sagittarius.	Globular cluster.
M. 17	18 15	−16 14	Sagittarius.	The "Omega" nebula.
M. 22	18 31	−23 59	Sagittarius.	Globular cluster.
M. 11	18 46	− 6 23	Aquila.	Fan-shaped cluster.
M. 57	18 50	+32 55	Lyra.	Ring nebula.
M. 27	19 55	+22 28	Vulpecula.	"Dumb-bell" nebula.
H. v. 14	20 53	+31 21	Cygnus.	Large irregular "Network" nebula.
M. 15	21 26	+11 45	Pegasus.	Globular cluster.
M. 2	21 29	− 1 14	Aquarius.	,, ,,
H. iv. 18	23 21	+42 2	Andromeda.	Bright planetary nebula.
H. iv. 30	23 53	+56 13	Cassiopeia.	Large cluster.

THE UNIVERSAL TIME SYSTEM.

Countries in which a *Standard Time* depending directly on the Greenwich Meridian has been adopted :—

Europe.

Great Britain	Greenwich Time.
Belgium	
Spain	
France	
Portugal	
Germany	1 hr. fast.
Austria-Hungary	1 ,,
Denmark	1 ,,
Italy	1 ,,
Switzerland	1 ,,
Norway	1 ,,
Sweden	1 ,,
Malta	1 ,,
Bosnia	1 ,,
Servia	1 ,,
Bulgaria	2 hrs. fast.
Turkey	2 ,,
Roumania	2 ,,
Iceland	1 hr. slow.

Africa.

Whydah	Greenwich Time.
Algeria	
Nigeria	0½ hr. fast.
Portuguese W. Africa and islands	1 ,,
Egypt	2 hrs. fast.
Union of S. Africa	2 ,,
Rhodesia	2 ,,
Portuguese E. Africa	2 ,,
Italian Somaliland	3 ,,
Madeira	1 hr. slow.
Sierra Leone	1 ,,
Portuguese Guinea	1 ,,
Azores	2 hrs. slow.
Cape Verde Islands	2 ,,

Asia.

Aden	3 hrs. fast.
Mauritius	4 ,,
Seychelles Islands	4 ,,
Chagos Archipelago	5 ,,
India	5½ ,,
Burma	6½ ,,
Straits Settlements	7 ,,
China (East)	8 ,,
Philippine Islands	8 ,,
Formosa	8 ,,
North Borneo and Labuan	8 ,,
Macao	8 ,,
Portuguese Timor	8 ,,
Korea	9 ,,
Japan	9 ,,

America.

Fernando Noronha	2 hrs. slow.
Brazil (3 zones)	3–5 ,,

Canada and U.S.

Longitude:

E. coast to 67½° W.	4 hrs. slow.
67½° W. ,, 82½ W.	5 ,,
82½ W. ,, 97½ W.	6 ,,
97½ W. ,, 112½ W.	7 ,,
112½ W. ,, W. coast	8 ,,

British Guiana	4 ,,
Lesser Antilles	4 ,,
Bahamas	5 ,,
Jamaica	5 ,,
Panama	5 ,,
Peru	5 ,,
Chile	5 ,,
Honduras	6 ,,
Yukon	9 ,,
Alaska	9 ,,

Australasia.

W. Australia	8 hrs. fast.
S. Australia	9½ ,,
Victoria	10 ,,
Tasmania	10 ,,

New South Wales	10 hrs. fast.
Queensland	10 ,,
New Zealand	11½ ,,

Sandwich Islands	10½ hrs. slow.
Samoa	11½ hrs. slow.

The time system 1 hour fast on Greenwich is called Mid-European; that 2 hours fast, East-European. The systems in use in Canada and the United States are called, in order, Atlantic, Eastern, Central, Mountain, and Pacific. The boundaries actually in use do not follow the above meridians exactly.

Dublin time, 25 minutes slow on Greenwich, is used in Ireland. The time used in Russia is that of the meridian of Poulkova, 2 hours 1 minute fast on Greenwich.

Any day of the week begins along a much bent line across the Pacific Ocean, which passes through Behring Straits, west of the Aleutian Islands, west of the Sandwich Islands, between the Tonga Islands and Samoa, and east of New Zealand.

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ASTRONOMICAL CONSTANTS.

Astronomical Unit	149,400,000 kms.; 92,850,000 miles.	
Solar Parallax	$8''\cdot80$.	
Moon's Equatorial Parallax	$3422''\cdot63$.	
Moon's Mass	1÷81·53.	
Equatorial Diameter of Earth	6378200 metres; 20926000 feet.	
Ellipticity of Earth	1÷297.	
Sidereal Year	365·25637 days.	Mean solar time.
Sidereal Month	27·32166 days.	
Sidereal Day	$23^{h}\ 56^{m}\ 4^{s}\cdot090$.	
Constant of Precession (1900)	$50''\cdot2564$.	
Constant of Nutation	$9''\cdot21$.	
Constant of Aberration	$20''\cdot47$.	
Constant of Gravitation	$6\cdot66\times10^{-8}$ C.G.S. units.	
Earth's Orbital Speed	29·76 km. per sec.; 18·49 miles per sec.	
Velocity of Light	299860 km.; 186330 miles per sec.	
Doppler displacement; 1 tenth-metre at Hγ (λ 4340·6)=	69·1 km. per sec.	
Pole of the Milky Way	R.A. $12^{h}\ 48^{m}$, Dec. +27°.	
Vertex of Star-streaming	R.A. $6^{h}\ 16^{m}$, Dec. +12°.	
Solar Apex	R.A. $18^{h}\ 2^{m}$, Dec. +34°.	
Solar Motion	19·5 km. per sec.	
Light-year	$5\cdot9\times10^{12}$ miles.	
Parsec (distance for 1″ parallax)	$19\cdot2\times10^{12}$ miles.	
Light Ratio for 1 magnitude	2·512.	
Sun's Stellar Magnitude	$-26^{m}\cdot5$.	
Solar Constant	1·932 gram-calories per sq. cm. per minute.	
No. of Square Degrees in the Sky	41,253.	

ORBITS AND MASSES OF THE PLANETS.

Planet.	Period.	Major semi-axis.	Eccentricity.	Inclination to Ecliptic.	Mean Daily Motion.	Mass.
	d			° ′	″	1÷
Mercury	87·97	0·387	·2056	7 0	14732·4	6,000,000
Venus	224·70	0·723	·0068	3 24	5767·7	408,000
Earth	365·26	1·000	·0167	0 0	3548·2	333,432
Mars	686·98	1·524	·0933	1 51	1886·5	3,093,500
Jupiter	4332·59	5·203	·0483	1 19	299·1	1047·355
Saturn	10759·23	9·555	·0559	2 30	120·5	3501·6
Uranus	30688·45	19·218	·0463	0 46	42·2	22869
Neptune	60181·3	30·110	·0090	1 47	21·5	19314